2000-09

The application service provider market: a guide for Navy Line Managers

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THESIS

THE APPLICATION SERVICE PROVIDER MARKET: A GUIDE FOR NAVY LINE MANAGERS

by

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September 2000

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REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	September 2000	Master's Thesis

4. TITLE AND SUBTITLE :
The Application Service Provider Market: A Guide for Navy Line Managers

5. FUNDING NUMBERS

6. AUTHOR(S) Montoya, Michael M.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Naval Postgraduate School
Monterey, CA 93943-5000

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
N/A

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES
The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT

This study explores the use of application service providers (ASP) as an alternative to the traditional practices of procuring, managing and maintaining software applications and the associated hardware infrastructure. The ASP model is a method of outsourcing that calls for an ASP to manage in one concise service the acquisition, and management of all hardware and software required to meet the end-user's needs. This includes all elements of support including configuration management and maintenance. The customer purchases this service on a subscription basis.

The findings show that ASPs have the potential to be a viable and financially stable solution in meeting the Navy's and the federal government's need of reduce the complexity and cost of delivering software applications. However, a cost and benefit analysis should be performed to verify the final costs prior to any implementation. Further, the enabling thin client and server-based computing technologies all show they can provide benefits for an organization interested in centrally managing and maintaining applications.

14. SUBJECT TERMS
Application Service Provider, Outsourcing, Pricing Models, Total Cost of Application Ownership, Thin Client, Server-based Computing, Service Level Agreements

15. NUMBER OF PAGES
124

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

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THE APPLICATION SERVICE PROVIDER MARKET: A GUIDE FOR NAVY LINE MANAGERS

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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

from the

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LIST OF ACRONYMS

AC	Anderson Consulting
AIP	ASP Infrastructure Provider
AMO	Application Maintenance Outsourcing
AO	Application Outsourcing
ASP	Application Service Provider
ASPIC	ASP Industry Consortium
CAMS	Customer Account Management System
CAT	Customer Assistance Team
CFO	Chief Financial Officer
COTS	Commercial off the Shelf
CRM	Customer Relationship Management
CSC	Computer Sciences Corporation
EC	Electronic Commerce
EDS	Electronic Data Systems
ERP	Enterprise Resource Planning
FAQ	Frequently Asked Questions
GUI	Graphical User Interface
IBI	Internet Business Infrastructure
ICA	Independent Computing Architecture
IDC	International Data Corporation
IIS	Internet Information Server

IP	Internet Protocol
ISP	Internet Service Provider
ISV	Independent Software Vendor
IT	Information Technology
ITAA	Information Technology Association of America
JVM	Java Virtual Machine
LAN	Local Area Network
MRP	Manufacturing Resource Planning
NSP	Network Service Provider
NC	Network Computer
NCM	Network Computing Model
NetPC	Network Personal Computer
NGWS	Next Generation Windows Services
NOMB	Not on My Backbone
OM&S	Ongoing Management and Support
OS	Operating System
POC	Point of Contact
PP	Peering Point
PPP	Point-to-Point Protocol
PwC	PricewaterhouseCooopers
RDP	Remote Desktop Protocol
SLA	Service level Agreement
TCA	Total Cost of Application Ownership

TCCM	Thin Client Computing Model
TCO	Total Cost of Ownership
TCP/IP	Transmission Control Protocol/Internet Protocol
TCSBC	Thin Client/Server-Based Computing
TDCM	Traditional Desktop Computing Model
TSE	Terminal Server Edition
UT	UUNet Technologies
USi	USinternetworking
VAR	Value Added Reseller
VPN	Virtual Private Network
VT	Video Terminals
WAN	Wide Area Network
WBT	Windows-Based Terminal

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ACKNOWLEDGEMENT

I would like to extend my thanks and appreciation to a number of people for their assistance in making this thesis a valuable learning experience.

First of all, I would like to thank the staff of the Dudley Knox Library for all their support in providing private study rooms and the resources necessary to conduct literature search for this thesis.

Secondly, I would like to extend a personal thanks to my primary thesis advisor Dr. William Haga, whose patience and wisdom led to the successful completion of this paper and to associate advisor Douglas Brinkley for his keen insight in providing fine-tuning of the thesis.

Finally, deep, heartfelt and special thanks are extended to my wife Patricia, son Jared and daughter Abbey. They have been wonderful. Abbey, thank you for entering my life during this time, you have been a real source of inspiration. Jared, thank you for keeping me young at heart and providing me with those daily reminders of what's really important in life. Patricia, my biggest thanks go to you, for reading every page for grammar and content, providing your love and understanding on a daily basis, sacrificing your needs to follow me around the world to allow me to meet mine and for providing me with a sense of purpose in my life. Without you, none of this could have ever been possible.

It has been a humbling experience, honor and privilege to attend NPS and, ultimately, all thanks goes to God.

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I. INTRODUCTION

A. PURPOSE

The application service provider (ASP) model represents a new approach to acquiring, managing and delivering software applications. The model emerged as one of the foremost global information technology (IT) trends during 1999 and 2000. (Terdiman, 2000) The concept calls for organizations to subscribe to or rent the delivery of application services from a vendor that specializes in the ASP model. ASPs mirror utility companies, with the idea that software applications are a utility and provided as a service, where customers are concerned with results rather than the process. This service offers to deploy, host, manage and provide access from a remote, centrally managed facility. Although the ASP concept is designed to reduce the complexity and cost of providing software applications, Chief Information Officers (CIO) and IT managers are confused about the ASP model, its advantages and disadvantages, as well as true costs of using such a service.

Initially, this thesis was to consider thin client/server-based computing (TCSBC) as a possible solution to the growing problem of managing complex applications in a distributed desktop computing or client/server environment. This was to be accomplished through a cost and benefit analysis of a TCSBC model in an existing implementation at a Department of Defense organization. However, after an exhaustive literature review none were available that included the necessary data to conduct an analysis and it also became apparent that the TCSBC model was just one of many enabling components of the emerging ASP model.

Facing an insufficient source of data, this thesis focused on a general study of the ASP model, which leverages TCSBC, with the intention of providing the CIO and IT manager, a practical guide to this emerging industry. This study reviews all areas of the ASP model such as:

- Key differences between an ASP and traditional outsourcing
- Types of applications available
- Common application delivery strategies and companies involved
- Competencies and technology components required
- Technical and business factors driving this paradigm
- Enabling technologies
- Pricing models
- Service level agreements.

In addition, this research illustrates many other important factors regarding ASPs, thereby informing and benefiting future CIOs and IT managers considering the use of ASPs.

The data suggest that the nascent ASP model represents a revolutionary change in the way software applications and related services will be delivered. It shows that the market for these services is growing in value and hype almost daily, and because of the hype, it is important that prospective customers have a general understanding of the value proposition offered by ASPs. (Korzeniowski, 1999) It shows the ASP model to be an extension of applications outsourcing. It also indicates that as more products and tools become available to enable or rewrite legacy applications and to provide more functionality to current web-based applications, the ASP model will find customers willing to use these services. Ultimately, it is how well and how responsibly the ASPs

execute that will determine the growth and viability of the ASP model. It is in an ASP's best interest to fully deliver on its contracts and meet or exceed customer's expectations. Although customers must be cognizant of ASP hype, it is the ASPs that have more to lose if they disappoint users. Notwithstanding, the ASP model has the potential to reduce the challenges of IT and improve how government agencies procure, manage and work with software applications.

B. RESEARCH QUESTIONS

1. Primary Research Questions

- What is an Application Service Provider (ASP)?
- What are the advantages and disadvantages of ASPs?

2. Secondary Research Questions

- What are the different classes of ASPs?
- What is the difference between traditional outsourcing and ASPs?
- What are the many components that make up an ASP?
- What is driving (market enablers) the ASP paradigm?
- How do ASPs price and market their services?
- What applications are currently available from ASPs?
- What are the key enabling technologies?
- What are the business and technical drivers the ASP model?
- What are the key differences between traditional desktop computing, client/server computing, and the ASP computing models?
- How do you assess (service level agreements) an ASPs ability to deliver?

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II. APPLICATION SERVICE PROVIDER CONCEPT

A. APPLICATION SERVICE PROVDER

1. Introduction

Application service provider (ASP) is a term that came into existence in the latter half of 1998. It describes companies that sell software as a service rather than a product. Providing software as a service is analogous to utility companies that provide water, sewer, gas and electricity for a monthly usage fee. Other industries that have capitalized on the utility concept include telephone and cable television companies and even more recently Internet service providers. In fact, FutureLink, Inc., an ASP company headquartered in Irvine California has even coined itself the "Computer Utility Company." This new delivery model has gained momentum as the software, hardware and the networking industries have converged to create a new solution. See figure 1.1. Software is no longer written as a proprietary product. Instead applications are developed

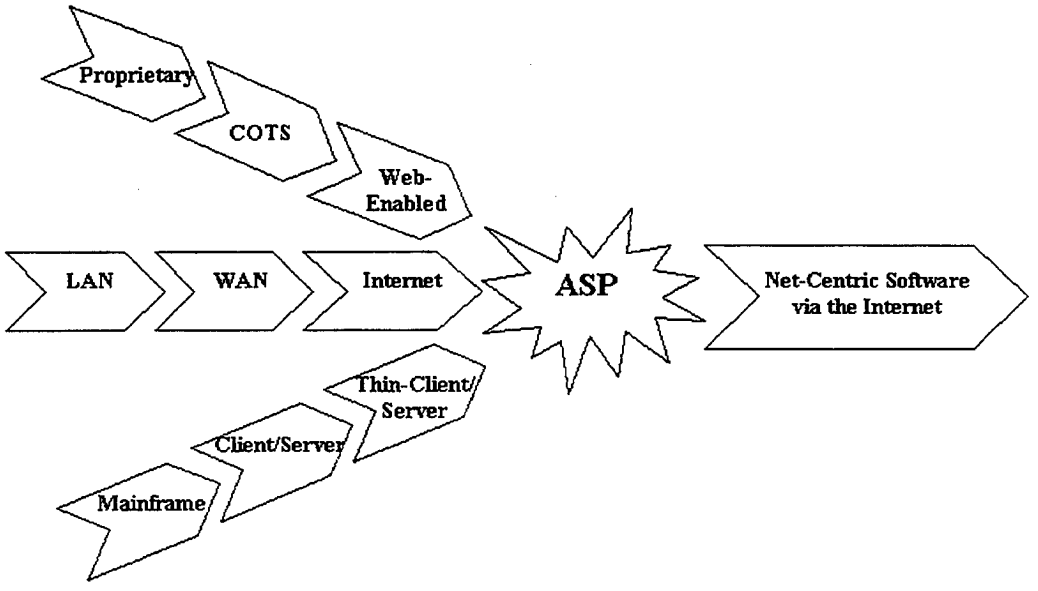


Figure 2.1. The Convergence of Software, Hardware and the Internet

using the N-tier architecture model so that they are "web-enabled" out of the box. Further, the migration from high-cost office local area networks (LAN) to wide area networks (WAN) to the continuos build-out of the Internet as a low-cost delivery mechanism has allowed net-centric software to be delivered over the Internet. In short, this new software delivery paradigm allows ASPs to leverage their software, infrastructure and personnel resources across multiple customers creating economies of scale and thus driving down their costs. (Dean & Gilchrist, 2000)

2. What is the Definition of an ASP?

There is some confusion as to what is the exact definition of an ASP. As more self-proclaimed ASPs emerge from different information technology sectors they tend to promote hybrid models which, in turn, threatens to render a common term meaningless. These sectors range from software developers to applications outsourcers and from web portals to Internet service providers. (ASP News Review & Farleit Limited, 1999) Although most of the companies that currently identify themselves as an ASP do indeed provide application access from afar on rental basis there are some that provide slightly different twists. For example, some ASPs sell their applications to the customer first, then offer management services separately. Some ASPs are independent software vendors (ISV) that bundle commercial off the shelf (COTS) applications, hardware, implementation and connectivity services and ongoing applications support into one packaged solution. Some call themselves ASPs and only provide connectivity services, data center services or rent excess capacity. Some ASPs are "pure play" companies, formed for the sole purpose of application provisioning; still others are "born again" firms trying to shift gears and enter this new market. (Waters, 2000) Inasmuch as these

early ASP players attempt to link or brand the ASP concept with its own industry, there is consensus that ASPs have one common goal, in that they are providing an online application from a remote data center for a negotiated fee. Hunter says "this is about provisioning and service of business-process-enabling applications delivered over a network via a subscription-based outsourcing contract ... that is where the true challenges lie". (Waters, 2000)

The following is a definition that is being used to define ASPs. International Data Corporation says that: (Gillian & McCarty, 1999)

> "ASPs provide a contractual service offering to deploy, host, manage and rent access to an application from a centrally managed facility. ASPs are responsible for (directly or indirectly) providing all of the specific activities and expertise aimed at managing the software application or set of applications."

An ASP Industry Consortium (ASPIC) was established in May 1999 by 25 founding members such as Cisco Systems, Citrix Systems, Compaq Computer Corporation; IBM, Ernst & Young LLP and AristaSoft Corp. Appendix A lists all 25 founding members. By the end of 1999, ASPIC had reached a membership of over 315 members. ASPIC sponsors ASP research, education, best business practices and standards as well as communicating the measurable benefits of this evolving industry. (Corbett, 2000)

3. Defining Characteristics of an ASP

a. Application-Centric

ASPs offer access and management services on a variety of commercially available software from low-end e-mail and messaging applications to high-end Customer Relationship Management (CRM) or Enterprise Resource Planning (ERP) applications via the Internet or WAN.

b. Selling Application Access

ASPs render applications access to the customer by one of three pricing schemes, (1) a per user monthly subscription, (2) application usage, or (3) a transaction fee basis. The benefit of these fee-for-service models is that they offer the customer access to new application environments without making capital investments in software, hardware and personnel resources.

c. Central Application Management

ASPs provide the management of applications, infrastructure capabilities and on-going support services from a central location for multiple customers rather than a single customer's site.

d. One-to-Many Relationship

The ASP model is designed as a one-to-many relationship allowing the ASP to leverage its resources through economies of scale. Conversely, traditional applications outsourcing focuses on a one-to-one relationship providing a solution that meets the unique needs of an individual customer.

e. Application Customization

ASPs normally partner with independent software vendors (ISV) who provide standardized packaged software applications. In turn, ASPs offer these applications to their customers with little or no customization. ASPs that do provide a level of customization increase their deployment timeframes, which impairs a key ASP advantage of quick deployments.

f. One Point-of-Contact For Each Customer

There are many are many companies working together to provide an ASP solution. The ASP is the company responsible, in the customer's eyes, for delivering on the customer contract. That is verifying that the application service is being provided as promised. If a problem arises, it is the ASP that is responsible for rectifying the problem even if the ASP works with other companies to provide the actual service.

4. ASP Versus Traditional Outsourcing

a. Introduction

Within the information technology (IT) services industry, outsourcing has evolved to provide increasing levels of specialization in the choices that it offers its customers. That is, at the onset of the outsourcing phenomenon, individual companies or Government agencies were reluctant to outsource their entire IT operations. Instead they started by selectively turning over specific parts of IT. In the beginning, it started with base level infrastructure components such as networking and data center functions. Today, outsourcing has evolved to include a wide variety of choices ranging from trouble center functions to web hosting activities. Other more recent outsourcing initiatives include managing mission critical software in the form of applications outsourcing (AO). AO, which is a subset of the entire IT outsourcing industry is broken down into two sub-segments. The first is application maintenance outsourcing (AMO) and the other is ASP outsourcing. (ASP News Review & Farleit Limited, 1999)

b. ASP Outsourcing Market

According to several private research organizations the ASP segment of AO is the fastest growing component in the IT outsourcing industry within United States.

This is supported by International Data Corporation's estimate that the ASP market will undergo a five-year compounded annual growth rate of 91%, exceeding $2 billion by 2003. (Kara, 1999) Forrester Research projects the ASP market to grow $11.3 billion with a compounded annual growth rate of 86%. (Dean & Gilchrist, 2000) The United States is not the only area experiencing ASP growth. The European ASP market is expected to rise from just over $10 million in 1999 to over $1.19 billion by 2004 with a 5 year compound annual growth rate of 130%. (Presswire, 2000a)

c. AMO Model

Traditional AMO models its services as a one-to-one relationship in which an outsourcer takes complete responsibility for and over the management of an application at the customer's location. This arrangement may include the transfer of assets and personnel resources normally associated with the application to the AMO but not necessarily. Historically, it is not uncommon for the applications to be proprietary; this is defined as applications that the applications outsourcer or the contracting organization developed.

d. ASP Outsourcing Model

Comparatively, the ASP model's defining characteristic is that it focuses on a one-to-many relationship in which the ASP manages multiple customers' applications from a central data center using the Internet or a private WAN to connect the user to the application. Other significant differences that distinguish the traditional AMO from the new ASP model include: (Terdiman, 2000)

- Packaged applications that are browser or internet enabled
- Shared operations – server-based processing and hosting

- Full life-cycle application services versus outsourcing only
- Simplified pricing and billing
- Limited customization versus custom built
- Rapid implementation
- Hides complexity from the user

B. ASP LANDSCAPE

1. Introduction

According to the ASPIC, as of April 2000 there were approximately 400 different companies offering ASP services. (M2 Presswire, 2000) It is essential to find a convenient way to understand and categorize what type of applications and services are available in the marketplace today. As a result of this growth and the broad range of applications and services available through the ASP delivery model, International Data Corporation (IDC) has conveniently developed what it calls a "market model" that helps

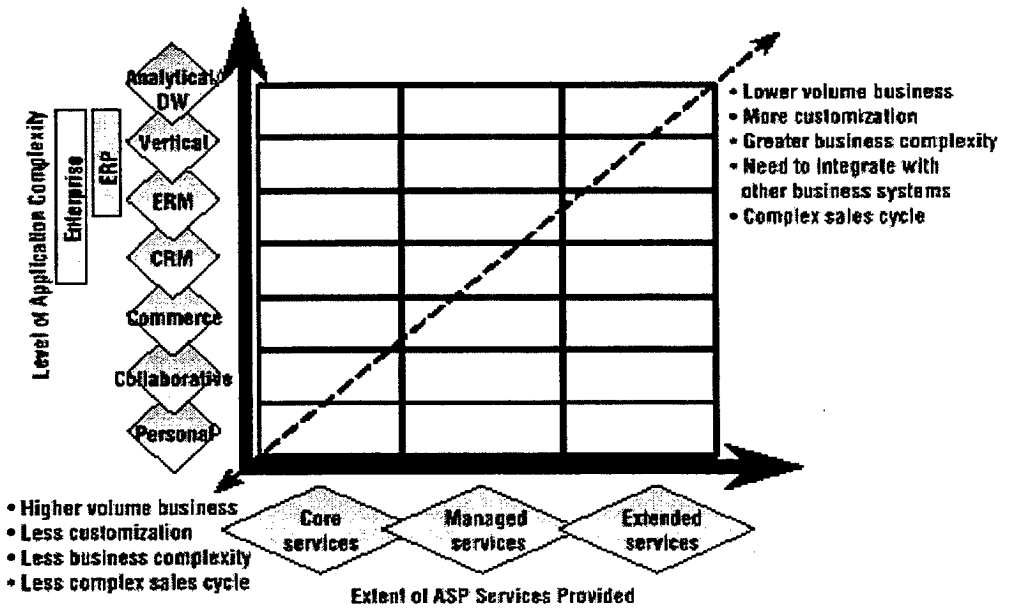


Figure 2.2. ASP Market Landscape (From Gillian & McCarty, 1999)

depict the ASP landscape by application type and the level of services offered. (Gillian & McCarty, 1999) IDC believes that the differing types of ASPs can be placed on a continuum that ranges from simple to complex, with the most basic of applications and services starting at the origin and becoming more complex as difficulty of the application and level of service increases. (Gillian, et. al., 1999) Figure 1.2 depicts this ASP market model:

2. Applications Available

The level of complexity of an application will be, in part, closely linked to the category and type of application being offered by the ASP. Simple applications are considered discrete and exist in isolation to address an individual business function. On the other hand, a complex application is considered environmental because it addresses an entire business process, whereby the process consists of multiple business functions that are integrated. As organizations move from discrete isolated applications to more environmental applications the more complex and increasingly integrated they become. The following list is not inclusive however, most of the common business applications used today fall into one of the following seven categories: (Gillian & McCarty, 1999)

a. Analytical Applications

These applications can include any program written to analyze a business problem or support business decisions (e.g., financial analysis, customer analysis, web site analysis, risk analysis, decision support, etc).

b. Vertical Applications

These applications can include any industry-specific programs, such as manufacturing resource planning (MRP) in manufacturing, patient billing in healthcare or claims processing in insurance.

c. Enterprise Resource Mangement Applications

These applications can include software systems for accounting and inventory, human resources and materials and facilities management.

d. Customer Relationship Management Applications

These applications can include software that supports sales force automation, customer service and marketing.

e. Commerce Applications

These applications include e-commerce software that enables business-to-consumer and business-to-business marketplaces.

f. Collaborative Applications

These applications can include groupware, e-mail, messaging, calendars and conferencing software products.

g. Personal Applications

These applications can include office productivity software such as word-processing, spreadsheet and presentation applications as well as home consumer applications like income tax, virus protection, encyclopedia, games and educational software. (Buckler, 2000)

3. Services Available

Based on a particular ASPs strategy and the needs of their customer, ASPs appear to be standardizing on three levels of services to include: core, managed and extended. These services are in keeping with the IDC market model, as seen in figure 1.3, in that they rise with the complexity of the application being offered. (Gillian, et. al., 1999) It is significant to note however, that as the ASP industry evolves the breadth and types of services offered are subject to change. These services are described below:

a. Core Services

These are the lowest level services provided by an ASP. These services include the foundation components that an ASP needs to provide in order to manage the application environment and provide a base level of customer satisfaction. These core services would include items such as application fixes and revisions, data security and back-ups, application availability, 24x7x365 monitoring of the application, network and servers on which the applications run and basic customer support. Basic customer support in core services most likely will not be a dedicated representative thus causing slower response times to customer inquires.

b. Managed Services

In addition to core services, managed services will include guarantees with respect to application performance, security, data redundancy and customer support. These guarantees would be outlined in service level agreements (SLA) that would quantify items such as application performance and availability, data security, number of dedicated technical support personnel and daily backup of the application and its data into measurable criteria. Other items that could be included into managed services are

ever-green agreements which guarantee that the ASP will always use the most current hardware and software support technologies.

c. Extended Services

Extended services include core and managed services plus additional professional services. Although the extended services will begin to model some characteristics AMO implementations they will still be delivered in the context of the ASP one-to-many relationship model. Extended services could include IT strategy and planning; custom application configuration and extension services; WAN services that include fail-over support; end-user services that provide training and educational support; and around-the-clock dedicated trouble call center support services.

C. ASP STRATEGIES

1. Introduction

ASPs will need to embrace an application delivery strategy that bests fits its business model. The strategy it chooses will most likely result from the company's application heritage or the type of application it initially offers. Once the application is chosen, companies will need to decide whether to focus on high or low-complex applications as well as whether to pursue vertical or horizontal markets. The decisions made here on strategies are not necessarily mutually exclusive. In fact, as the industry matures some ASPs may pursue multiple strategies in unison however, current information points to the fact that the present wave of ASPs are choosing a strategy or niche market and focusing on it. Figure 2.3 is a representation of the ASP strategies and some of the players in each sector. Below is a breakdown of the most common strategies found in today's ASP marketplace: (Weller, 1999)

	Vertical	Horizontal
Upstream Approach	**TriZetto Group, Inc AristaSoft, Corp**	**Usinternetworking, Inc FutureLink, Inc Applicast, Inc**
Downstream Approach	**Learning Station.com Personable.com**	**Critical Path, Inc TeleComputing, Inc**

Figure 2.3. ASP Business Strategies

2. Upstream Strategy

When an ASP adopts an upstream strategy it is offering applications that bring the most immediate and largest strategic value to its customers. These are typically considered high-end software products such as those found in the analytical, vertical, ERM and CRM categories. These are complex applications that cause organizations difficulty in building in-house expertise. Additionally, the skill set required for the initial implementation team to deploy these complex applications is far greater than the skills needed for less robust applications such as e-mail or office productivity software. When an ASP provides these types of applications for its customers, its goal is to become fundamentally entrenched with the customer because these complex applications will ultimately facilitate the majority of the customer's business. As a result, the ASP is

betting that the loyalty of the customer will be directly related to the importance and strategic value of an application. Another reason ASPs use this strategy is to cause the organization to continually use their services for other complex applications that would require some type of integration services. As an example, if an organization uses an ASP for its ERP requirements and then chooses to set-up an Internet EC site, they must decide whether the current or a new ASP will host the site. Either way, the current ASP will need to be involved with the integration of the two systems. From a customer standpoint it makes more sense to have the existing ASP host the new EC application and provide all the integration services rather than to have two separate ASPs trying to work in tandem. However, this can also run counter to the customer's interests since it has placed all of its eggs in one basket. If the relationship sours, the customer stands to lose. ASPs that choose this strategy will require greater expertise and will have to be cognizant of providing high levels of performance, availability and security on an around the clock basis. An upstream approach by far is the most risky for the ASP to pursue however, it has the greatest rewards.

3. Downstream Strategy

In comparison, ASPs that use a downstream strategy are focusing on hosting applications that are less-complex in nature. Applications that fit this criterion are the applications in the personal and collaborative categories. Static website hosting can also fall into the downstream strategy. These low-end applications require little integration. They provide the customer with little strategic advantage. However, ASPs claim that the technical management of these applications brings value to the organization through increased productivity. ASPs contend that if the organization is free to focus on "how to

use" the applications its productivity should increase. The driving factor in ASPs using this downstream approach is that the market for low-end applications is considered to be much larger than the market for high-end applications. This is validated by several industry sources that say customers of all sizes are interested in outsourcing simple discrete applications. Originally, it was thought that only medium to small customers would want to use ASP services for low-end applications. It was felt that they had little IT expertise or infrastructure. This has not been the case. Early adopters of these simple ASP services have been mainly large organizations. Some of the early applications being adopted include e-mail, messaging and static content websites or more affectionately called brochure-ware as well as high-end EC websites. The main reason given by these customers is that it relieves the pain of having to implement, manage and maintain these applications, not to mention the high cost of ownership they are incurring. Yet, for a monthly fee it all goes away leaving the customer to focus on its core business. (Weller, 1999) Another reason ASPs are adopting this strategy is that it will allow them to mainstream and brand their ASP offering with less-complex downstream applications that the customer may be more inclined to outsource. This will allow them to capitalize on the first mover advantage as well as give them time too later move or merge with an upstream ASP.

4. Vertical Strategy

Vertical ASPs provide solutions for a specific market such as healthcare, retail or manufacturing. For example, TriZetto Group, Inc a healthcare ASP may provide a single targeted product such as a laboratory application or an enterprise-wide solution that integrates applications from pharmacy, laboratory, radiology and patient billing. Vertical

ASPs also focus on integrating entire industries by integrating solutions that connect all the relevant constituents within a business community. An instance within the healthcare industry would be to create a value chain by integrating and connecting those applications that hospitals, providers, insurance payers and health maintenance organizations use – into an ASP environment. Using their expertise and understanding of a specific industry, vertical ASPs focus on developing highly standardized templates for both single applications and the integration of multiple complex applications. As a result of this focus, vertical ASPs are capable of deploying a solution faster since they are using standardized templates and spending less time in the "one-to-one" customer relationship. It is significant to note however, that vertical ASPs are in a sense potentially limiting their opportunities by having too narrow of a focus. This is especially true for vertical ASPs that are utilizing a downstream strategy and only offer low-end applications.

5. Horizontal Strategy

ASPs that choose a horizontal strategy are called enterprise ASPs. They do not limit themselves to a specific industry. Instead, they focus on building expertise in a variety of industries. The advantage for selecting an enterprise ASP is that a customer can do one-stop-shopping for all their applications requirements. Enterprise ASPs are typically thought of as providing an end-to-end integrated solution for its customer. The end-to-end solution is normally built around a menu of applications that are common to all industries and in most cases are from well-established and reputable ISVs. (Dean & Gilchrist, 2000) In order to address multiple vertical markets and with a upstream strategy in mind, enterprise ASPs will need to develop multiple industry specific

standardized templates that will be used in deploying and managing high-complex applications. This will be challenging since it will require knowledge and expertise from the varying vertical markets. This will be critical since enterprise ASPs could be challenged in minimizing deployment periods while at the same time securing resources to develop multiple standardized templates for each vertical market addressed. In comparison, an enterprise ASP that chooses a downstream strategy will not have as difficult a time in developing the expertise since the applications will be less-complex and most likely no customization will be required.

D. CLASSES OF ASPs

1. Introduction

Currently, ASPs are being branded and categorized according to their strategy, services and solutions they offer. This branding may or may not be warranted since ASPs may eventually pursue multiple strategies and markets. Nonetheless, ASPs are finding that they are being lumped into one of five different categories. The following is a discussion and list of these five categories: (Dean & Gilchrist, 2000)

a. Enterprise ASP

As described earlier, enterprise ASPs are companies that provide end-to-end solutions for their customers. Additionally, these companies focus on providing solutions for multiple vertical markets as opposed to just one. Application offerings may vary from high to low-complex which all depends on which strategy the company selects, either upstream or downstream.

b. Vertical ASP

On the other hand, ASPs in the vertical category cater their solutions to specific markets like healthcare, manufacturing or education. The benefit of vertical ASPs is that they offer a lot of domain experience with their solutions since their heritage and focus is industry specific. Similar to enterprise ASPs, vertical ASPs must focus on a strategy, which in turn determines the type of applications its going to offer.

c. Pure-Play ASP

ASP companies in this category are somewhat more difficult to define. They are considered companies in which their software is considered web-enabled. That is, the applications are written in an N-tier architecture, which is specifically designed for the web. This allows the ASP's customers to exclusively operate the application from the web browser. It should be noted that not all software currently available through the ASP model is designed with the N-tier architecture in mind. Other characteristics of the pure-play ASP are that a majority of their customer service functions is provided online.

d. Collaboration ASP

This category includes companies that provide mainly applications that are currently found in the collaboration and personal productivity categories. It is believed that these types applications are perfectly suited to be hosted by an ASP since it is considered that e-mail was "The Net's First Killer App" which has been widely accepted and that the natural migration is for similar applications. Similar to pure-play ASPs, collaboration ASPs use applications built in an N-tier architecture and provide a majority of their customer service functions online.

e. ASP Enabler

ASP enablers are not considered an ASP in the traditional sense since they do not offer software as a service. They are however considered an extremely important ingredient in that they help make the ASP solution possible. There are many companies that fall into this category and their sole purpose is provide some key enabling service for the ASP. These services can range from data center hosting services and network bandwidth providers to systems integrators and consultants.

III. COMPONENTS OF THE ASP MODEL

A. ASP STACK

1. Introduction

To successfully deliver application services several critical elements need to be in place. These elements or layers are commonly referred to as the ASP stack, architecture or value chain. The ASP stack is a set of interlocking layers with each layer having its own area of core competence. The ASP stack consists of four to as many as eight layers.

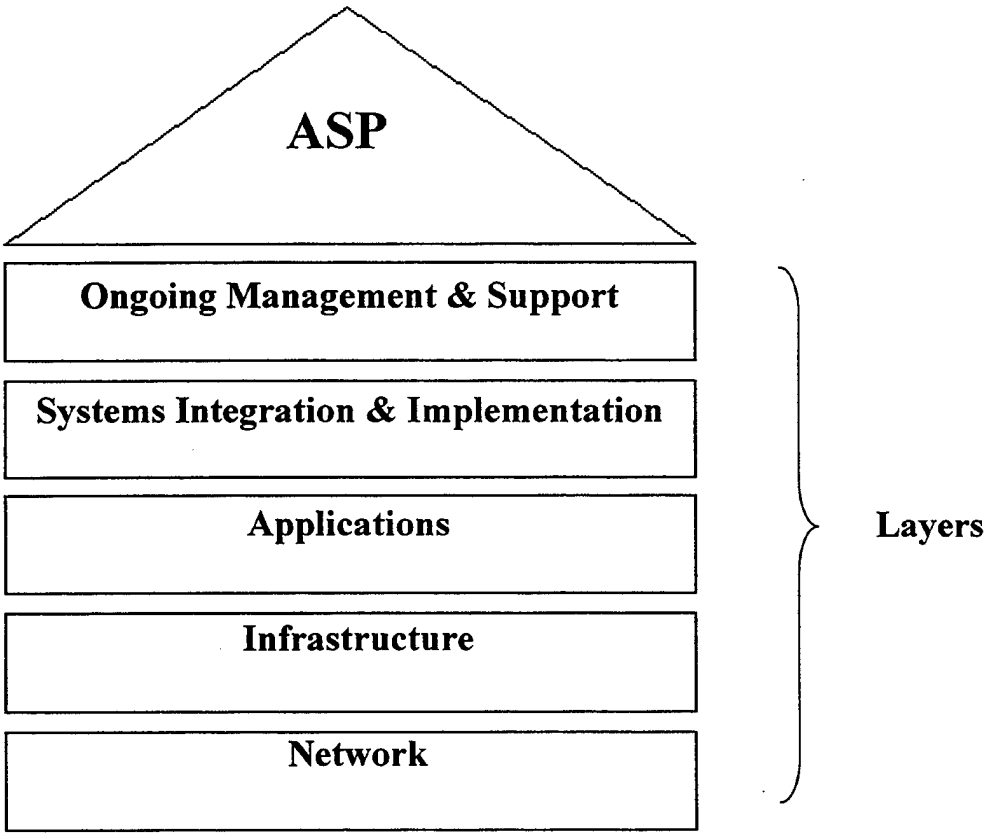


Figure 3.1. ASP Stack

See figure 3.1. The number of layers is not important. It is the fundamental breakdown and not the depth of composition that accounts for stack differences. This layered effect is a natural consequence of the computing architecture that enables the ASP model. As a result of the individual layers and competence required, different companies specializing in each layer are often performing the ASP solution in partnership. Even though the ASP solution is layered and has a different company overseeing it, it is paramount that the customers have a single point of contact for service and trouble calls. Customer service would otherwise suffer, as users would have to find the right agent for a specific problem. Additionally, agents could avoid addressing problems simply by not wanting to claim responsibility for issues. It is therefore not uncommon for a company that makes major contributions to an ASP's solution to never have a direct relationship with the customer. (Dering, 1999)

An alternate viewpoint that is not widely accepted argues that the ASP solution should not have several companies performing specialized services at each layer or across layers. Instead, they favor a vertically integrated ASP model in which the ASP owns and controls each of the layers from top to bottom. The claim is tighter integration and control at each layer. However, in this nascent market no one company has emerged which is uniquely positioned to carry out and be proficient in all layers required to be an ASP. (Coulter, 2000) Below are the layers of the ASP stack which include the ongoing management and support, systems integration and implementation, applications, infrastructure and network:

a. Ongoing Management and Support Layer

This layer involves the ongoing management and support (OM&S) of the ASP service. OM&S is what some ASPs consider to be their primary responsibility in the delivery of application services since it is a key touch-point between the ASP and the customer. As a result, once the applications, integration and implementation, infrastructure and network layers of the ASP stack have been implemented and the provision of applications is taking place this layer becomes the central focus. OM&S services offered by ASPs are typically based on an ASP's strategy and the needs of its customers. As described in chapter two, ASP OM&S services are converging into three categories, which include core, managed and extended services. Core services provide the most basic levels of OM&S while managed and extended services build on core services to provide for increasing levels of OM&S with greater guarantees. It is this layer that allows ASPs to be profitable because they can leverage the one-to-many relationship with respect to its OM&S services. Expense costs can be spread across multiple customers. An example of this would be a database or application expert, they can easily be leveraged across multiple customers using the same database or application.

(1) USinternetworking OM&S Example. USinternetworking (USi), a pure-play ASP, offers what it calls a client assistance team (CAT) for each of its customers. The customer can interact with their assigned CAT using telephone, e-mail or facsimile. The USi CAT is composed of subject matter experts that specifically address the applications being rented by the customer. CAT service is composed of two elements. First, a self-care or self-serve website that is focused on helping each paying customer to independently resolve issues. These websites are separate from their

company website and individually customized for each customer. These websites offer such items as problem status, FAQs, billing information, feedback forums, request forms and satisfaction surveys. Secondly, when intervention is required, USi's OM&S structure is composed of four levels. Level I and II involve taking the customer calls and working through basic problems or answering questions. In most cases, level I and II are operated by the same OM&S personnel. Once a problem is identified as being more complex or technical in nature level III OM&S personnel take over the call. USi's level III CAT personnel consist of applications engineers, network and computer operations personnel and security professionals that are experts and specialists in their respective areas. Level IV support is when USi considers the problem to be so complex or technical in nature that the original hardware technology vendor or ISV must be called in to rectify the problem. Examples of when level IV support would be invoked are when issues exist with the code of an application or the WAN goes down outside the control of the ASP. Other issues of concern for USi are the potential problems for finger pointing between the different components of support. For example, applications and network engineers fighting over who's responsible for a problem. To solve this, USi believes its integrated helpdesk system and ability to write just one trouble ticket allows all levels of support to track and work together to solve problems. (USinternetworking, 2000)

b. Systems Integration and Implementation Layer

The systems integration and implementation layer involves consulting services that are focused on helping the ASP and its customers use the most appropriate applications and technology in the most efficient manner. The services involve investigating, identifying and mapping out customer's business processes and application

requirements. Selecting and validating applications that meet these requirements and integrating them into the customer's business processes is also their function. Additionally, implementation services involve installing applications onto an operating system (OS) platform then testing and fine tuning the application and OS. If legacy systems exist, integration with the legacy system or conversion of the legacy system's data may be required with the new application(s). Training ASP customers in the use of the applications is also contained within this layer. Other functions related to systems implementation and integration include:

(1) Applications Customization. Implementation services may require some customization of applications to meet a specific customer's preference. The disadvantage to customization is that it normally involves some rewriting of the applications code to incorporate specialized business functions. This leads to several problematic issues such as: (1) delays in application availability due to reprogramming, (2) delayed application deployment timeframe, (3) customization is outside the competency of most ASPs, (3) runs against the one-to-many relationship and keeps the ASP in a one-to-one relationship and (4) creates difficulties in upgrading to new software versions. To address this issue, some ASPs are creating libraries of frequently sought customizations and providing them to their customers. (Cox & Pappalardo, 1999) Striking a balance between the level of customization offered by an ASP and achieving implementation will be key.

(2) Standardized Templates. Creating standardized templates are one of the most critical tasks performed at this layer and it's one of the primary drivers in rapid deployment of applications in the ASP delivery model. For example,

within specific vertical markets, typically 80-85 percent of the configuration performed is universal for all companies within that market. The remaining 15-20 percent is unique to each company. Therefore, by pre-configuring 80-85 percent of the applications options into standardized templates, ASPs are able to reduce deployment timeframes and costs. (Dering, 1999) An example of this in healthcare is where laboratory, pharmacy and radiology applications could have several standardized templates each created with a predefined formulary of commonly used lab tests, medications and x-rays.

c. Applications Layer

Software developers add the vital ingredient that enables the ASP model. However, the application layer can become confusing since the other layers of the ASP model also use software. For example, software providers contribute to the infrastructure layer by providing various products such as intrusion detection, firewall, security, virus, WAN optimization, middleware and operating systems software. In reference to the application layer, only end-user software products will be discussed. End-user software featured by ASPs originates from several ISVs but ultimately the applications offered by the ASP are either adapted for delivery or developed from the onset to be net-centric. The following are some of the issues that ASPs will need to consider when selecting software:

(1) Software Development. The architecture of the applications developed by ISVs will be important since the performance of an application over the Internet or WAN will have an impact on the ASP's ability to deliver. Currently, ISVs engineer their software products to operate from a client/server platform. They also use the windows graphical user interface (GUI) as their standard interface. As a result,

many of the current applications currently used in the ASP delivery model are adapted using either the Citrix Independent Computing Architecture (ICA) or Microsoft Remote Desktop Protocol (RDP) technologies, which delivers just the presentation layer of the GUI based interface to network clients. This method, though reliable, is not efficient. In order for ISVs to achieve true Internet application efficiency they need to program future applications based on the N-tier development model. (Dering, 1999) Further requirements will be writing software that supports multiple instances of an application running on one server as well as the security and performance issues that go along with this capability. (Dering, 1999)

(2) Legacy Software. Not all ISVs want to rewrite their software. (Briody, 2000) In fact, some are reluctant to transition their software products to N-tier formats because they claim the development platforms and tools currently available are not as mature as the tools used to develop their legacy products. Because of the immaturity of the tools and development platforms, these ISVs feel they will lose some of the functionality currently within their products. Other concerns involve the huge development efforts required to reengineer a software product from scratch and lastly a decrease in their customer base because of a loss of the traditional windows look not featured with N-tier developed products.

d. Infrastructure Layer

The infrastructure layer, which is a rapidly growing area within the ASP industry, acts as the hardware platform and data center for the delivery of application services. This layer is also referred to as a hardware, hosting or operations layer. The infrastructure layer comprises the value-added services required to support applications in

the ASP delivery model, along with the computing resources on which these applications run. Currently, small e-mail and web-hosting providers exist that offer baseline services in this area but their capabilities are limited. As a result, new companies are being formed and skills, services and tools are being developed to support the delivery of multiple business applications. These new companies are called ASP infrastructure providers (AIP). The AIP's primary offering is a data center environment that provides for applications and server hosting and includes monitoring, registration, authentication, usage reporting and billing. This suite of services and tools allows ASPs to outsource the operational components below the application layer and avoid the costly and time intensive task of developing and deploying a comparable infrastructure internally. Following is a more detailed description of the services and functions that the AIP layer provides. It should be noted that some of these services, depending on the ASP's business model, could overlap into other layers of the ASP model.

(1) Security Measures. Security includes protection for all areas of the data center. Security precautions include user authentication, virus detection, firewalls and intrusion detection. Physical security measures include such items as smoke detection, fire suppression, motion sensors, video camera surveillance, secured access and security breach alarms. Other protections include environment control and uninterruptible power supply systems. (Exodus, 2000)

(2) Customer Accounts. Customer account management system (CAMS) manages customer accounts by tracking profile and permission information. It manages the provision of the applications and options and controls each

customer's access to applications and records their usage. CAMS is normally integrated with the billing, helpdesk and service level management systems.

(3) Customer Billing. The customer billing system translates customer usage and service delivery statistics into a bill or invoice that is prepared for the customer. Available customer billing systems have the potential to measure application usage down to the second or per transaction, factoring in discounts or premiums according to the service levels attained.

(4) Helpdesk Services. Helpdesk services are integrated with customer account and billing management systems so as to provide a repository of information about each customer's profile. Helpdesk features include integration with service level agreement (SLA) information and applications management resources. This service also provides the capability to escalate trouble calls seamlessly to second, third and fourth party support and the ability to track the entire process to demonstrate conformance to agreed upon SLA commitments.

(5) Service Level Management. An SLA and management function that tracks and reports on the service levels being experienced by customers. It is also responsible for monitoring the service levels being received from subcontracted companies to verify that they remain in accordance with agreed upon levels.

e. Network Layer

The network layer of the ASP stack is made up of telecom providers, Internet protocol (IP) carriers and Internet service providers (ISP), which are collectively referred to as network service providers (NSP). They operate the Internet and WAN infrastructures, implement the physical WAN connections and perform all the functions

necessary to enable delivery of IP services such as network caching, streaming media and virtual private networking (VPN). In some cases, network service providers offer data center facilities, which overlaps with services provided with the infrastructure layer. Choosing a NSP to partner with is becoming difficult for ASPs because of the increasing amount of information being put on the Internet and how it can affect an NSP's service. It's imperative that the NSP fit the ASP's needs and that an understanding of this is developed. Following are some of the key factors influencing the network layer of the ASP stack: (Woods, 2000)

(1) WAN Capacity. The NSP's WAN and how it's engineered is a key concern for the ASP. The capacity of the WAN and how much of it is currently being used is critical in determining an NSP's potential for delivering on a contract. NSPs with limited capacity or too many customers will be unable to deliver adequate bandwidth for real-time operation of mission critical applications. NSP WANs typically transmit data at OC-12 and as high as OC-48 speeds. They also have multiple circuit capability. See table 3.1.

NAME	DESCRIPTION
T1 Carrier	1.544 Mbps using conventional telephone transmission
ATM – 25	25 Mbps over twisted pair copper wire
T3 Carrier	44.736 Mbps using conventional telephone transmission
OC – 1 SONET	51 Mbps transmission over optical fiber
OC – 3 SONET	155 Mbps transmission over optical fiber
OC – 12 SONET	622 Mbps transmission over optical fiber
OC – 48 SONET	2.4 Gbps transmission over optical fiber

Table 3.1. Data Transmission Speeds (From Chellis, Perkins & Strebe, 1997)

(2) WAN Redundancy. The NSP's WAN should have redundancy to prevent single point failures. That is, does the NSP have fail-over fiber or redundant routes? If redundant fiber does exist, was it laid side-by-side in the same path as the primary fiber? If so, it runs the risk of failing along with the primary fiber because cut fiber is usually a result of construction projects. If the NSP doesn't have redundant fiber then redundant routes are even more critical. Redundant routes allow WAN traffic to take alternate routes to their destination during times of WAN failures. With redundant routes, it's important that they can handle the increased WAN traffic during outages. If not, there won't be enough bandwidth on the redundant route to get the data traffic to its destination. For example, if several customers are pushing a cumulative of 2 Gbps of data through an NSP's OC-48 circuit and it gets severed, the redundant route must absorb that additional 2 Gbps of data without degradation otherwise the ASP's credibility decreases.

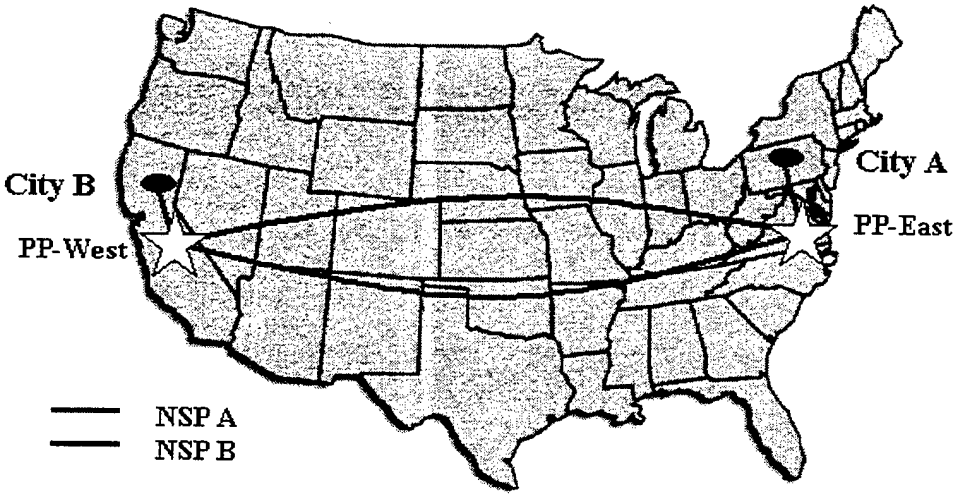
(3) WAN Peering Points. Determining the location of the NSP's peering points can determine how traffic is managed on its WAN. NSP peering points, also known as hand-off and network access points, are categorized as two types: private and public. Both types of peering points are used to allow traffic to cross between different NSP's WANs. Public peering points allow connectivity to the public Internet. These peering points are located in most major cities and provide support for various communication protocols as well as hosting facilities for NSP hardware. NSPs use public peering points to interconnect themselves with the Internet as well as other NSP WANs. NSPs interconnect with public peering points at strategic locations throughout the world so that its WAN traffic easily reaches a particular destination. Drawbacks to public

peering points are that they can become very congested. This is because there is no limitation to the amount of NSPs that can connect and route data onto the Internet.

Private peering points are specific points at which two or more NSPs connect their WANs. Access to these peering points is by invitation only. Private peering points allow NSPs to control who accesses their WANs, as well as the amount of traffic that can flow between them. Private peering points are more stable since they can be more easily controlled but if these peering points are limited it can cause traffic to be routed out of its way to reach a destination.

(4) WAN Ownership. Another consideration is ownership of the WAN the ASP is using. Often times, an NSP will acquire other NSPs or contract for additional bandwidth capacity from a third party carrier and sell it as its own. If this is the case, the ASP needs to determine the third party carrier's track record in the same way as if the NSP owned the WAN.

(5) Not On My Backbone. NSPs can relieve data traffic congestion on their WAN by practicing the not on my backbone (NOMB) concept, which can have an effect on the quality of service received by customers. See figure 3.3. The NSP accomplishes this by shifting customer traffic to the Internet or another NSP's WAN as quickly as possible. This is done via one of the private or public peering points. The question then is why is the data being rushed onto someone else's WAN, especially if the NSP claims to have a superior WAN? A quality NSP will deliver or attempt to deliver customer traffic as close as possible to its final destination using its own WAN. Finally, the key to addressing WAN service is to have a SLA in place that specifies the ASP's responsibilities and the penalties if the NSP fails to deliver in any area.



NSP A needs to transmit data from its WAN in City A to City B, which is located on NSP B's WAN. With NOMB, NSP A will place the data on NSP B's network as quickly as possible (at PP-East) instead of carrying the data on its own WAN to the peering point closet to the destination (PP-West) and then handing it off.

Figure 3.2. Not On My Backbone (After Woods, 2000)

2. Conclusion

Despite how the ASP is structured, the ultimate objective is a seamless service in which the customer only interacts with the ASP. The most significant elements of a seamless integration of services include providing the hardware and software, integration and testing, a secure network infrastructure, reliable mission-critical data center facilities and a highly-qualified team of IT experts managing the entire solution. (Klemenhagan, 1999)

B. ASP PLAYERS

1. Introduction

Because of the broad set of competencies necessary to be an ASP there is a diverse set of companies participating in the market. Depending on the ASP's experience, it will be both stronger in some competencies and weaker in others. As a result, some companies are becoming the ASP, taking on the responsibility for delivering the application services, while others partner with an ASP and provide a service needed for the ASP to deliver its application services. These services can range from data center facilities to network connectivity and bandwidth and from applications expertise to software systems integration. (Dering, 1999) Figure 3.3 shows the various IT sectors that are trying to become players in the ASP marketplace. The figure depicts the ASP market as a triangle. Large circles represent the application, network and service players. A portion of companies in the larger circles is expected to participate in the ASP market as ASPs; the segment of the circle inside the triangle represents them. The others, outside the triangle, are expected to partner with ASPs and become ASP enablers. (Gillian, et. al., 1999) The small circle in the center shows those companies that are pure-play ASPs. Pure-plays, as described in chapter two are those companies that were specifically started to address this market. Although characterized as pure-play ASPs, it should be noted that their founders usually have a experience from one or more of the application, network or service areas. (Dering, 1999) Software and hardware suppliers and distributors and resellers services are also active in the ASP market. Software suppliers are providing the tools that help ASPs run their operations and deliver their services. These software tools, which are characterized differently from true end-user applications, include products such

as intrusion detection, firewall, security, virus, WAN optimization and operating systems software. Hardware suppliers include server, storage or network device companies that supply ASPs or ASP enablers with hardware for their data centers and WANs. Some indications are that the initial winners of the ASP phenomena are hardware and software suppliers. This is because of the increased demand for these products as ASPs continue to come online and add capacity to meet a growing customer base. (Burney, 1999) Finally, along with selling their traditional shrink-wrapped software products, value-added resellers (VAR) and ISVs are also becoming distributors of ASP services. Described below are some of the potential ASP players:

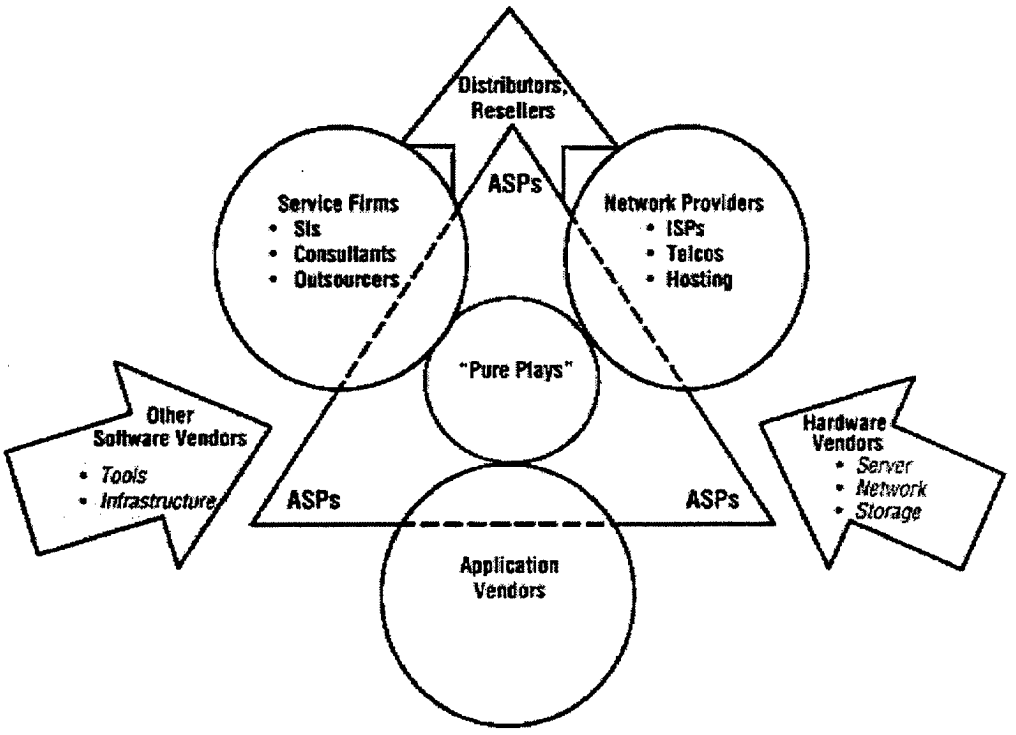


Figure 3.3. ASP Players (From Gillian & McCarty, 1999)

a. Network Providers

Bandwidth is essential for the success of the ASP model. The presentation of rich media content over the Internet demands bandwidth. Mission critical applications demand bandwidth. Using software run by an ASP thousands of miles away as smoothly as though the application were right there on your desktop demands bandwidth. Telecom companies and ISPs are providing connectivity and bandwidth for the ASP model. These companies are both participating as ASPs and partnering with ASPs. For example, Qwest, a broadband communications company, has partnered with consulting firm KPMG and has launched as ASP business unit called Qwest Cyber.Solutions. This unit rents low-end collaboration software from Microsoft as well as high-end applications from Oracle, PeopleSoft and Siebel Systems. In this partnership, Qwest uses their worldwide fiber optic network to provide connectivity and the bandwidth for the ASP services. In turn, KPMG provides the integration, consulting and implementation services as well as over 500 certified applications specialists. In contrast, AT&T and MCI WorldCom both consider the ASP market important but they are not trying to get into the ASP business itself. Instead, they both have spent hundreds of millions of dollars to upgrade their infrastructures in support of ASPs. These upgrades include modernizing their communications backbones and adding data center facilities. The goal is to be positioned as the carrier of choice when it comes to partnering with ASPs. (Wallace, 2000) Other companies characterized as "new wave" are also trying to sell connectivity and bandwidth to ASPs but with a different twist. Metromedia Fiber Network is a company focused on building an end-to-end fully integrated fiber-optic WAN that connects major commercial buildings in and across the 50 largest U.S. cities, as well as

16 cities in Europe. Metromedia has partnered with AboveNet Communications to provide data center facilities for this WAN so ASPs can co-locate their hardware and software and link-up to the WAN. The result is what Metromedia refers to as "one-hop" access to their entire U.S. and European WAN. This private WAN is also connected to the rest of the global Internet. (Corbett, 2000) Some experts predict that the network provider industry and in particular the largest carriers such as AT&T, Sprint, US West, Qwest and MCI WorldCom will emerge as the dominant ASPs because they currently own the key customer touch points such as customer accounts, billing and usage management systems. Additionally, as the carriers begin to add their name to an ASP's services, it should be influential in helping ASPs develop brand awareness and trust with their customers. (Burney, 2000)

b. Application Vendors

With the ASP model centered on the application being delivered as a service, it makes the most sense for ISVs to emerge as the leading ASP candidates. Instead, ISVs are unsure of how to approach this new marketplace. ASPs are changing the way ISVs and VARs normally get paid. From a one-time payment to a stream of monthly payments or some variation thereof. This in itself has made it necessary for ISVs and VARs re-evaluate their business models as well as to re-educate sales teams on the benefits of annuity payments vice a one-time sales transaction. (ASP News Review & Farleit Limited, 2000) Because of this uncertainty, ISVs are either standing up an ASP business unit or are partnering with an already established ASP or perhaps doing both. Two of the most visible examples of ISVs becoming ASPs include Oracle and SAP who are traditionally ERP vendors. Oracle, in 1999, launched an ASP business unit called

Oracle Business OnLine, which offers all of its software products as a service. Oracle's CEO Larry Ellison has said that the software industry is in the process of a huge change that will end with software being delivered as a service. Because of this shift, he felt it was necessary for Oracle to offer ASP services. Ellison goes on to say that unless users of software understand this and begin to prepare for this transition, they're going to be left behind. (Waters, 2000) In addition to being an ASP, Oracle is partnering with vertical ASPs. These partnerships allow Oracle to penetrate markets in which they have little or no expertise. In one of their recent partnerships with Portera Systems, Oracle will begin offering their products to the professional services market, which they previously had been unable to penetrate. (Mateyaschuk, 2000a)

In the case of SAP, the world's fourth largest supplier of software, they have launched an ASP subsidiary called mySAP.com which specializes in vertical markets. The focus is providing SAP applications to businesses in a collaborative environment. SAP's main motivating factor for starting mySAP.com was to prevent being out of a potential sales channel. That is, continue to sell traditional shrink-wrapped software to those customers who prefer the traditional model of hosting their own software, but to also offer their software products as an ASP. In contrast, Microsoft, largely known as a ISV of personal productivity and operating systems software, has not publicly announced intentions to form an ASP business unit but instead has partnered with several established ASPs such as Corio, FutureLink, Data Return and WinStar Communications. These partnerships have positioned Microsoft to be an ASP enabler. On one hand, Microsoft will supply the industry with software characterized as ASP plumbing products. These products include its next generation windows services

(NGWS) which is foundation technology written exclusively for the Internet and based on its product line of operating system platforms and internet information server software. On the other hand, Microsoft also plans to feature its line of personal productivity software such as Microsoft office, works, exchange mail and others via these same partnerships. (Mateyaschuk, 2000) These are but a few of the examples of how the ASP model is shaping the software industry.

c. Service Firms

Service firms entering the ASP marketplace include traditional applications outsourcers, systems integrators and consultants like Electronic Data Systems (EDS), IBM Global Services (IBM), Computer Sciences Corporation (CSC), Anderson Consulting (AC) and PricewaterhouseCoopers (PwC). They are commonly referred to as the "big five". These firms moved aggressively during 1999 and 2000 to become an ASP or to partner with ASPs. For example, PwC created it's own ASP business unit and has begun to provide CRM and ERP applications to some of its traditional customers, that is, for those customers which PwC would have normally brought in its technical resources and people to operate the systems at the client's premises, using the client's platforms. In other situations, the client's processes, people, equipment and applications would be moved into a PwC solution center and operated remotely. PwC's decision to become an ASP was because it considered ASP core competencies to be expertise in business processes and implementation of systems as well as ongoing maintenance and operations of applications and its supporting technologies, which they specialize in. However, PwC needed help creating its ASP business so they partnered with several ASP enablers. PwC 's partners are diverse and

include partnerships with Intel Online Services, which provides data center-hosting services. They also partnered with Telstra, one of Australia and Asia's largest telecommunications and information services provider who will provide telecommunications, hosting and ISP expertise for PwC's customers within the Asian and Pacific region. (PwC, 1999) In contrast, IBM's global services division does not consider itself an ASP but instead offers a full range of packaged service offerings to customers that want to be ASPs. IBM's ASP COTS service offerings include solutions that help ASPs or ASP enablers in offering e-commerce, hosting or messaging solutions. For instance, the e-commerce solution incorporates the hardware, software and consulting services necessary to go live with a high volume transaction website like an Amazon.com. Similarly, their hosting solutions are based on differing packages of hardware, software and services that IBM has coined WebSphere which claims to beat the competition by providing a high-performance application environment that is robust, scalable and secure.

2. Conclusion

These are just some of the many examples of what companies are doing within the network, application and services sectors to try and capitalize on the ASP business opportunity. However, it is clear to see that it's impossible to conjure up a perfect image of a complete, single-sourced ASP solution. In reality, a typical ASP offering is the result of a number of companies partnering together. Thus, the term ASP has become very loose in meaning and has been applied to a wide variety of companies.

IV. CATALYSTS DRIVING THE ASP MODEL

A. ASP CATALYSTS

1. Introduction

Business success is dependent upon the speed at which an organization can empower its employees and reach its customers. Technology is now a key component in that role and of all the tools available today, software is one of the most critical. Organizations that can provide state of the art software as well as extend the reach of those applications to users wherever, whenever and however they are needed are able to develop a strategic advantage. But delivering applications in a diverse environment is becoming more complex and as expensive. (Kapoor, 1999) This is because organizations must contend with the high cost of buying software in addition to the increasingly difficult technology required to own and operate complex IT. As a result, the ASP model has taken center stage and cases can be made for the business, technical and technology drivers that are propelling this new software delivery paradigm.

2. Business Drivers

Below are some of the business drivers influencing the emergence of the ASP model:

a. Total Cost of Application Ownership

The total cost of application ownership (TCA) or sometimes referred to as total cost of ownership (TCO) has become an important evaluating criterion for the IT industry. The basic TCA models used by analysts in the IT industry to forecast costs are fundamentally the same with regards to the evaluating criteria however, the final costs

computed sometimes can vary greatly. The three most common TCA models used today to evaluate costs include the following: (Kapoor, 1999)

- Traditional desktop-computing model (TDCM)
- Client/server or network-computing model (NCM)
- Thin client/server-based computing model (TCSBC)

Regardless of the final cost computed by the various analysts in regard to the three models, all agree that the most expensive TCA is the TDCM with the cheapest being TCSBC. Because of the lower TCA associated with the TCSBC model, organizations are becoming more interested in evaluating an ASP's services since it is the TCSBC model upon which ASPs are based. ASPs are using it as a major selling point in attracting customers. Klemenhagan, IT analyst from Cherry Tree Investment and Kapoor, IT analyst from The Tolly Group both use different TCAs for benchmarking costs however, both indicate an organization can expect to save anywhere from 30 to 50 percent on TCA depending on what applications they rent. (Klemenhagan, 1999 & Kapoor, 1999) Some early ASP customers like PointClick.com's CIO Brown has revealed that they have already saved at least 30 percent in IT costs, which validates these claims of lower TCAs. (Violino, 2000) Other documented reports conducted by Gartner Group show a dollar savings of up to 50 to 70 percent for customers using ASP services in the enterprise software space. (Terdiman, 2000a)

b. Improve Focus on Core Competencies

The transfer of the implementation and management of an application to an ASP will enable an organization to focus on its core competencies. In an InformationWeek survey, 70 percent of the companies polled agreed that one of the

factors considered when they started using an ASP was that it allowed them to free up staff to focus on internal issues. (Klein, 2000) By using an ASP, the organization benefits because operations personnel can better focus on an organization's key business objectives. IT personnel also benefit in that they can focus on more strategic items such as planning the organization's future technology direction or helping to improve the fit between technology and business processes as opposed to being inundated by IT maintenance tasks.

c. Distributed Workforce

In today's organizations, applications must be extended to a growing number of mobile and geographically dispersed users, both inside and outside the organization. Applications must be accessible across a wide range of connectivity options, from low-speed ISP dial-up connections to wireless as well as through dedicated private NSP WANs and Internet connections. According to Dering (1999) there are approximately 30 to 40 million telecommuters and home-based employees in the United States. Because of the diversity of access required, an organization can leverage its accessibility and provide its users with access to mission-critical applications anywhere at any time by using an ASP's services. ASPs meet this need by providing WAN services that can be accessed by customers worldwide. For example, Exodus Communications, an ASP enabler, has partnered with several ASPs to provide its NSP and AIP services. Exodus Communications has approximately 140 public and private peering arrangements with numerous telecom providers such as AT&T, MCI WorldCom and Qwest as well as, ISPs such as AOL and Excite@Home. (Exodus, 2000a)

d. Reduced Capital Investment

Using an ASP allows organizations to avoid the large up-front capital investment that comes with building an in-house IT capability. Capital outlays for traditional IT projects can exceed millions of dollars for organizations and are at high risk for technological obsolescence due to short technology refresh cycles. With an ASP, the cost of running applications shifts from a capital expenditure to a monthly operating expense, thus allowing organizations to refocus this capital on improving the organization in its key business areas. (Dering, 1999) Customers also have the added advantages of transferring the risk of technological obsolescence to the ASP as well recouping costs that would be normally associated with upgrading or enhancing their in-house IT capabilities under a traditional computing environment. (Klemenhagan, 2000)

An example of this risk transfer by a organization is the United States Department of Interior's, Mineral Management Service which cites the lowering of their initial costs and creating predictable monthly usage fees as the key reason why they hired ASP USi to provide them with PeopleSoft's financial applications. USi will host and manage the PeopleSoft applications at its Annapolis, Maryland data center and provide access to the Mineral Management Service's employees in their Denver, Colorado offices. Other benefits cited by the Mineral Management Service are that they will have access to state-of-the-art capability as well as the elimination of issues such as planning for disaster recovery, or conducting back-ups and just simply staying current with new technical developments. (Hayes, 2000)

e. Accelerated Implementation Periods

With already operational and scalable application solutions, ASPs enable customers to get up and operational in shorter periods of time than in traditional IT implementations done by in-house IT shops or big-five firms. In fact, Dean and Gilchrist (2000) indicate that traditional CRM or ERM software implementations can take anywhere from 6-24 months to go operational whereas similar implementations using an ASP can take as little as 60-120 days. For applications that are considered complex and environmental, this can be a very important factor since a shorter implementation period can reduce the amount of time the customer has to wait to begin realizing a return on its investment. Another benefit with the fee-for-service approach is that the customer does not pay for anything until the ASP gets the purchased applications up, operational and in use. In a traditional implementation, the customer has to buy all the necessary hardware and software components up-front before ever beginning the implementation process. This can lead to many months or years before the customer can actually realize a return on their investment.

f. Turnkey Solutions

ASPs bundle together several IT components into one seamless service where the customer only interacts with one point of contact (POC). This provides two benefits: First, there is a shift in the role of the general technology vendor or VAR in that they now focus their efforts on partnering with or selling their services and products to ASPs vice individual organizations. Secondly, customers using an ASP solution realize a reduction in the amount of decision making and administrative burden that's normally associated with traditional application implementations. Under traditional application

ownership a customer normally manages several relationships with multiple technology companies. For example, with a typical CRM implementation, a customer, at a minimum, would be required to manage relationships with the ISV providing the CRM application, hardware vendors providing the platform equipment and a systems integrator that assists with integration, implementation and activation of the application(s).

3. Technical Drivers

Listed below are some of the most common technical drivers or factors influencing the emergence of the ASP model:

a. IT Staffing Shortage

Organizations of all sizes are experiencing shortages in skilled IT labor. This shortage has increased over the past five years and some sources indicate that the shortage will only get worse in the years to come. A staffing study sponsored by the Information Technology Association of America (ITAA) indicates that there will be a requirement for 1.6 million IT workers in 2000 and approximately 850,000 of these jobs will go unfilled. This is up from 340,000 unfilled IT jobs that ITAA reported in 1998. (ITAA, 2000) Further, Schafer (2000) indicates that this shortage will rise to over one million IT job vacancies in the United States alone by 2005. Shortages in IT labor are not the only problem being experienced by organizations. Retention of qualified IT personnel is also becoming a major problem. IT professionals are increasingly being lured to new jobs here in the United States as well as abroad because of higher salaries, bonuses, stock options and other perks. Another example highlighting this tight IT labor market includes annual pay increases. Current surveys indicate that pay increases for IT workers now exceed 10 to 15 percent per year whereas non-IT workers are traditionally

limited to four-percent raises. (Schafer, 2000) As a result of these staffing woes, ASPs offer a unique value proposition in that they absorb a customer's need to have a highly skilled and staffed IT department. The ASP provides all the expertise and staffing needed to deliver the ASP solution relieving the customer of this need. The ASP is able to do this because they can leverage IT professionals across multiple customers creating economies of scale that help it reduce its cost.

Not all agree that ASPs will have such an easy time recruiting the required IT expertise that they will need to offer a viable solution. Kara (1999) contends that ASPs offering specialized applications will have an even harder time finding the appropriate personnel since its apparent that all ASPs are offering the same software packages. This is because there are generally only a few ISVs that write enterprise software for each vertical industry such as healthcare or manufacturing. Kara (1999) goes on to say that individuals with specialized expertise are few in number, difficult to recruit and expect top salaries. Because of this customers really have no guarantee that an ASP will have enough people with the requisite skills to meet a specific applications need. Under this scenario, prospective customers could hedge their investments in ASPs by only considering using ISVs that are providing their software as an ASP solution. Chapter 3 discusses ISVs Oracle and SAP who have started ASP business units Oracle Business Online and mySap.com that have begun to provide their software products as a service. Clearly, it will be incumbent on the customer to ask the question of their ASPs how they will maintain specific levels of qualified software experts.

b. Importance and Complexity of Technology

Modern applications are evolving beyond those that address simple or discrete problems to ones that address entire business processes or functions across processes that are tightly integrated together. As a result, they become more complex and difficult to implement and manage. At the same time, the hardware computing platforms are evolving from mainframes to distributed environments, in essence creating islands of information processing and storage. Along with this software and hardware complexity, organizations are demanding high levels of application performance, availability and security on a 24x7x365 basis. All of these factors together are causing organizations of all types to rethink their capability to effectively manage both the complexities of hardware and software along with the entire IT environment.

c. Ability to Scale Rapidly

As an organization's application requirements expand or the number of users increases, ASPs are better able to rapidly scale their services to support this expansion than would an organization in a traditional distributed personal computer (PC) or client/server environment. Specifically, the ASP's network and infrastructure layers are specifically designed to be scalable so as to be able to create an economy of scale. With added customers, ASP's just build out their server farms and add bandwidth capacity to meet the additional application requirements. From the ASP's perspective, this is what they want. Additions to their existing customer base are advantageous since it leverages its initial investments in hardware, software and personnel and provides for a diminishing marginal cost. On the customer side, they simply access the new applications via the their browser or if they add more users its just a matter of deploying additional

thin client devices. In contrast, in the distributed PC-based environment additional expensive hardware and software must be purchased and technical staff must then configure and deploy each PC to its user. Additional servers and personnel may also be required with the PC-based environment.

d. Software Version Control

With the ASP's model of a centralized environment, all software resides on the ASP's servers, making administration of licenses and application enhancements or installation of new software releases far simpler than they would be in a conventional distributed PC-based environment. Any changes made to the ASP's hosted applications are done once and are instantly available to all the ASP's users. Additionally, control of the unauthorized or unlicensed use of software is better controlled and software piracy is eliminated. Estimates indicate that most commercially available software in broad circulation undergoes at least three administrative upgrades for software bugs and one major revision per year. (Wyse, 1998) These regular bug fixes and revisions, in addition to the associated hardware upgrades, are permanent parts of the PC-based environment. Upgrades done in this environment can be very disruptive, costly and time consuming since technical staff must complete each upgrade locally at each machine. Under the true ASP thin-client/server based computing model this is not the case.

e. Data Storage and Backups

Within an ASP's managed and administered environment, customer data is stored centrally. ASPs generally perform daily backups and provide for data mirroring to remote locations as a precaution in the event of a server failure or to keep operations ongoing as a result of a natural disaster. Not only do these safeguards protect against

data loss, degradation or theft, but it also simplifies regular backups because they are only accomplished once. (Dering, 1999) Contrast this with the challenge of trying to continually backup PCs in a distributed environment or trying to get the individual users to do so. When a local PC hard drive fails, not only does it need to be replaced but it also poses data retrieval problems if the data was not continually backed up. Also, it is almost a given that very little if any offsite or data mirroring is accomplished in a PC-based environment.

4. Enabling Technologies

In order to fully appreciate the ASP paradigm it is important to get an understanding of the various computer devices and technologies that are shaping this new industry. Described below are the primary technologies influencing the emergence of the ASP model:

a. Thin Client/Server-Based Computing Model

The thin client/server-based computing (TCSBC) model is considered by some to be the next step in the evolution of IT. (Hewlett Packard, 1998) This is because it encompasses some of the most popular features of the past several decades such as manageability and control of a centralized server-based environment in addition to the famed GUI and the ability to run applications traditionally found on a desktop PC. So what is TCSBC and how does it work? TCSBC is a computing environment that involves connecting a user device such as a NetPC, Windows-based terminal (WBT) or PC to an applications server using a network protocol such as Citrix's Independent Computing Architecture (ICA) or Microsoft's Remote Desktop Protocol (RDP). (Kanter, 1998) With TCSBC, 100 percent of the client's application processing is done on the

server. Only screen updates, keystrokes and mouse clicks are passed over the network. See figure 4.1. With this technology, all application logic is processed at the server and then the network protocol passes only the presentation layer of the GUI interface back to the client. This technology is also referred to as "screen-scrape" technology. Because processing is done at the server, bandwidth requirements are low and security and manageability features are improved. The weakness of TCSBC is that customers are dependent on the servers for processing and thus, server performance can become a bottleneck. (Compaq, 2000) Introducing additional servers and load balancing capability as processing requirements increase easily alleviates server performance issues. ASPs, through their SLAs, generally provide contract provisions for application availability, response time and service quality as a way to eliminate customer concerns. (Whitmarsh, 1999)

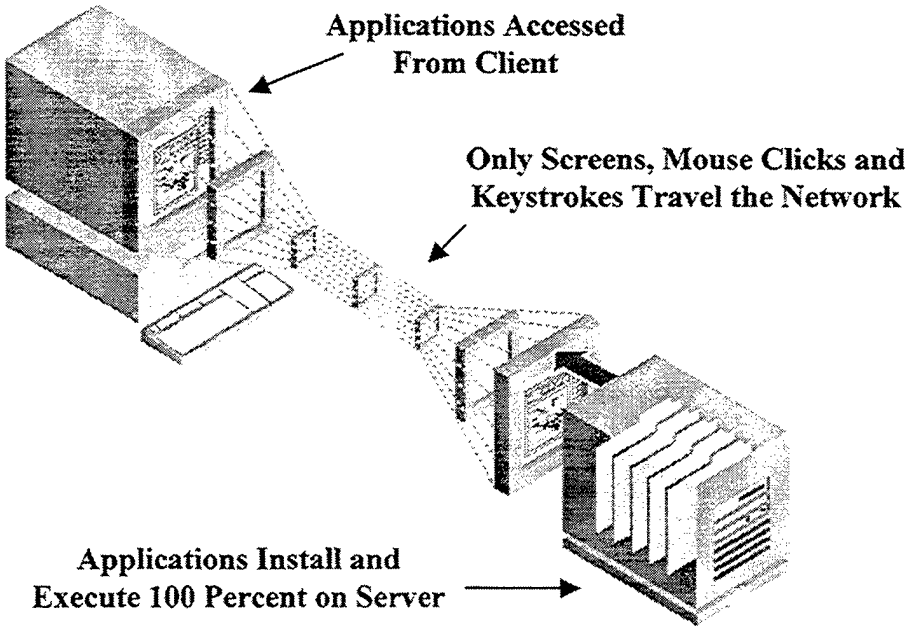


Figure 4.1. Thin Client/Server-Based Computing Model (From Citrix, 1999)

b. Thin Client Devices

What is the definition of a thin client? In industry today there is no commonly agreed upon definition or standard for what a thin client is or should be. This is a result of the many variations of thin client devices being used and produced in the market as of this writing. Functionally all thin client devices are essentially used in the same fashion with only minor differences. That is, they are connected over a network to a central server or servers operating in a multi-user mode. The objective of the thin client is to provide a window into the server where the application logic and data resides. Depending on the thin client in use, most interact with the remote server(s) through legacy input and output devices such as keyboards, mice, barcode scanner/reader(s), monitors, speakers and printers. Thin clients generally do not have floppy, hard disk or any of the commonly used compact disc drives. Instead, true thin clients are designed to have as few moving parts as possible and employ as little memory and processing power as they can reasonably get away with. (Angel, 2000) Williams (2000) states that certain thin clients like WBTs can be up to nine times more reliable than PCs. Williams (2000) goes to say this is because PCs tend to crash due to their inherent complexity.

Since 1995 a number of thin client alternatives have emerged claiming to be the true thin client. Some of these devices have been accepted by the ASP industry while others have not. These devices include network computers, NetPCs, Windows-based terminals or the traditional PC acting as thin client. Major differences are related to the amount of local or remote application processing power each one supports, capabilities of their operating systems and the disk drive configurations, if any, that are possible. Below is a summary of these devices and their capabilities:

(1) Network Computer. The network computer (NC) was developed jointly by IBM, Oracle and Sun Microsystems to be used as a thin client system that capitalizes on the Java-based technology. Although marketed as the perfect thin client, NCs are not considered a true thin client within the IT industry. (Dewire, 1999) Instead, the NC is considered a hybrid system because it downloads Java applets for local execution during networked connections. These applets can be either entire applications or portions of applications. When booted, the NC loads its OS either across the network or from flash memory. The user's programs such as terminal emulators, a web browser, Java virtual machine (JVM) and other Java applications and data are then downloaded across the network to the NC. In some cases, some of the software like the OS, browser and JVM may reside in flash memory but typically they do not. Downloaded applications and data are then cached and run locally during the users session. Once the session is terminated, the modified data are written back to the server and the NC discards any programs resident in memory. Frequent downloading of applets makes the NC viable for only higher bandwidth WANs since Java applet file sizes range from four to six megabytes. Without adequate bandwidth, users signing on during peak hours such as the beginning of the business day or mid afternoon can degrade WAN performance down. Some contend that Java's use of bandwidth is actually a benefit, since it only uses it intermittently and in bursts. Another benefit claimed by the makers of the NC is that it can access Java applications and download applets from any server platform such as Windows, Macintosh, Unix and Linux. (Wyse, 1998a) Although Java as a language has had success, the NC has not. In fact, development of the NC has been slow and there has been very little ASP acceptance of it as a thin client device. This is

primarily because NCs are only designed to execute applications based on Java. This alone makes the NC a non-factor for ASPs that are providing applications that are Windows-based. Secondly, Java applications and applets are very large which requires the NC to have a lot processing power and memory. This makes a NC look very much like a PC.

(2) NetPC. The NetPC is a platform that was co-developed by Microsoft and Intel in response to the NC. (Kanter, 1998) The NetPC, like the NC is considered a hybrid system and not a true thin client. Sometimes called a locked-down or stateless PC, the NetPC is a closed box that is riveted shut with no external floppy or CD drives and no expansion slots. (Wyse, 1998) The concept behind the NetPC is to put operational capabilities under tight centralized control. To carry this out, Microsoft and Intel created what they call the Zero Administration for Windows (ZAW) and wired for management (WfM) protocols. First, Microsoft developed its ZAW protocol, which is based around managing five of the NetPCs major functions. See table 4.1. Next, Intel then created the Wired for Management (WfM) protocol. WfM was designed to ease the management of hardware by attaching a unique ID to each component that allows administrators to remotely manage and configure them. These two technologies attempt to consolidate administrative and management functions onto the central server. The NetPC was also envisioned as a way to eliminate the ability of the computer hacker or amateur computer enthusiast from snooping or performing hardware or software changes or upgrades. The NetPC, like a PC and NC, still executes applications locally. However, similar to the NC the software is downloaded to the NetPC with each use. According to Dewire (1999) this poses a problem since a majority of commercial software available is

very bloated terms of file size and its questionable to how long it would take to download. The NetPC's benefits are that it reduces the user ability to introduce viruses or non-authorized programs into the computing environment. It also enhances information security since corporate data cannot be written to external floppy drives. Although the NetPC improves manageability, like the NC it is not a favorite of the ASP marketplace since it is also very similar to a PC. The NetPC still carries the same vulnerabilities as a PC such as processor speed, memory, and useful life limitations along with susceptibility of hard disk failures and the greatest vulnerability of all: obsolescence. To compound above issues, the NetPC doesn't make use of screen scrape technology employed by the TCSBC model. Instead, the NetPC operates in the traditional distributed PC-based environment model with only minor improvements in the administration and manageability of applications.

COMPONENT	DESCRIPTION
Auto Configuration	User automatically updates settings from a central server
Automatic Desktop	Applications are automatically installed onto the desktops of users that need them
Automatic System State Storage	All data is mirrored on the server, creating an instant backup
Central Administration & Lockdown	Access to users, software and hardware is controlled by a central administrator on the network
Application Flexibility	Widows and Java software is supported locally or remotely

Table 4.1. Zero Administration for Windows Major Components

(3) Windows-Based Terminal. Most users of thin clients consider the Windows-based terminal (WBT) to be the thinnest of all the thin clients available and hence offer the best overall cost and manageability. WBT's rely on the

TCSBC model where 100 percent of all application processing and storage is carried out on the server. The WBT can be thought of as an intelligent display device that presents a GUI to the user. Only mouse clicks, keystrokes and screen updates move back and forth from the WBT and server. That is, as the server runs it processes a separate session for each user and as it receives and interprets mouse movements from those WBT users it performs all necessary processing including retrieving and updating data as well as continually updating the user's WBT display. WBTs are designed to access and display a variety of applications. They include native web applications (written in N-tier formats) that can be viewed within browsers as well applications written for Windows NT, UNIX and LINUX platforms. Additionally, WBTs are capable of displaying text-based legacy applications using emulation software. WBT's do not support hard drives but do have serial and parallel ports which allow peripheral devices such as floppy drives and printers to be connected. WBTs do not use conventional operating systems such as Windows NT or UNIX. They have a boot program that's preloaded onto an internal firmware chip, which communicates with the server when the WBT's power is turned on.

Unlike the NC or NetPC, the WBT is becoming the de facto standard for thin client computing. Wyse (1998) contends that WBTs offer users the following benefits: See table 4.2.

BENEFIT	DESCRIPTION
Simplifies and Improves IT Administration	The WBT is focused on the TCSBC model that centralizes resources applications and data. This leads to improved productivity and cost savings. For example, upgrades and backups are more consistent because IT has direct control over applications and data. Security, virus protection disaster recovery and Internet access is made easier to plan, implement and control. WBTs present a standard configuration and are faster and easier deploy and activate. Help desk support and WBT moves. adds and changes are also made easier.

Lowers TCO Per User	Projected savings depend on a mix applications and other factors, but there is agreement (among analysts that do TCO/TCA studies) that the largest savings come from a reduction in end-user operations costs because WBTs are simple to use and are centrally managed. With WBTs, users get full GUI benefits without the complexities of a PC. WBTs allow for easier configuration and repair. Faster and more uniform software updates and a way to achieve consistent standards and policies. Decreasing the diversity of platforms supported translates into cost savings.
Increases Data Integrity and Security	The restricted functionality of WBTs eliminates the opportunity that can lead to difficulties. Specifically, WBTs prevent users from storing data locally or from introducing new data or software except through keystrokes within a standard application. This lowers the risks and time spent undoing problems.
Lengthens Desktop Longevity	WBTs offer investment protection from technical obsolescence when compared to NCs, NetPCs and PCs. This is because WBTs have nothing to upgrade. The upgrade cycle for WBTs is estimated to be 4-6 years.
Centralizes Resources	Servers and disk arrays supporting WBTs are centralized for ease of administration and control. This centralization also leverages user ability to share storage, memory and processing power.

Table 4.2. Benefits of Windows-Based Terminals

(4) Desktop PCs as Thin Clients. The PC, which is also called a fat client, is a complete computing machine with its own microprocessor, memory and hard drive capacity in addition to audio, video and sound capabilities. PCs even have their own operating systems, software applications and other software tools to ensure their independence. How, then, can a PC be thin client? The two systems are diametrically opposite. The PC can take on the role of a thin client in one of two ways.

First, with emulation software PCs are capable of mimicking video terminals (VT) that are generally used for accessing text-based legacy applications normally found on mainframe computers. These emulators extend the life of mainframe applications in an environment that has largely moved away from VT-based applications

to one that includes GUI interfaces and incorporates color, graphics, sound and video into almost all programs.

Secondly, PCs are being used as thin clients to receive an ASP's services as well to run its locally based applications. As an example, customers are using PCs to run local applications like personal productivity software and then accessing their ASP to run high-end enterprise applications. Simply, the customer logs on to the ASP's website and uses a web application through the PC's browser or they use the ICA or RDP protocol to establish a session with a traditional Windows-based application.

Organizations are not only using PCs to enjoy the benefits of both fat client and thin client computing. Some are using them strictly as thin. By doing this, organizations can leverage sunk costs and extend the life of previously obsolete x86 or Pentium-based PCs. As Kanter (1998) points out, "Now you can stop using those old computers as doorstops". Thin client software like the ICA or RDP enables organizations to make use of PCs that would otherwise be considered too old, slow and not sufficiently powerful to run today's applications. In fact, a number of vendors have products that help convert old PCs into thin clients. (Sinclair & Merkow, 2000) The drawback to using recycled PCs is the legacy monitors. Some will have pre-VGA monitors, which will not be suitable for delivering quality video. Consequently, for a recycled PC to work, VGA monitors and cards may have to be purchased to work with the legacy PCs.

c. *Thin Client Software*

(1) Independent Computing Architecture Protocol. The ICA protocol, developed by Citrix Systems, is a remote presentation services software protocol that separates an application's logic from its user interface. With ICA software,

only keystrokes, mouse movements and screen updates travel the network and is very bandwidth efficient. See figure 4.2. With its proprietary technology, ICA shifts the burden of application processing from the client device to the server. The ICA is

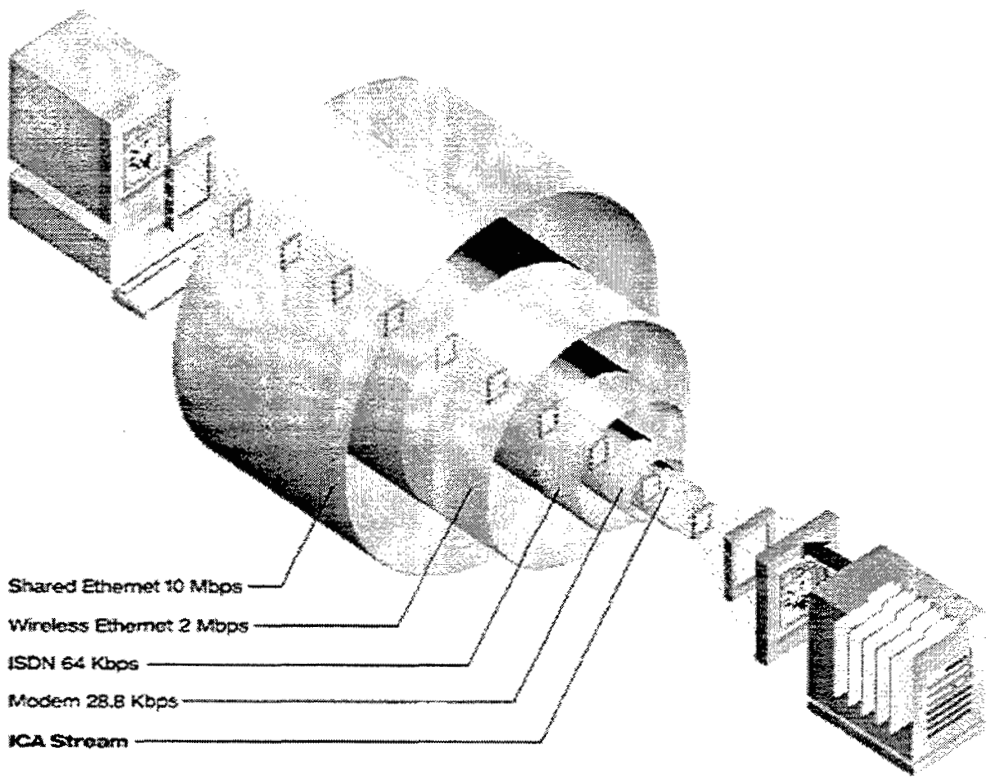


Figure 4.2. Bandwidth Requirements for ICA Protocol (From Citrix, 1999)

composed of three components to include a server software component, network protocol component and a client software component. The server component separates, at the server, the application's logic from the user interface. The network component transports the interface to the client over standard network protocols such as TCP/IP, NetBEUI, IPX/SPX and PPP as well as standard network connections such as dial-up, ISDN, DSL,

asynchronous, frame relay and ATM. The client component then refreshes the user's device with the application's interface. (Citrix, 1999) Tests show that the ICA protocol uses less than 20 Kbps of network bandwidth during a typical user session. (Angel, 2000) The ICA protocol supports both 16 and 32 bit applications for a number of devices to include Windows PCs, NetPCs and WBTs as well as other clients that are based on the Macintosh, Unix, Linux and Java platforms. See table 4.3. With over 15 million licensed users as of 1999, the ICA protocol is mature, reliable and is quickly becoming the "gold standard" for the TCSBC model being used by ASPs. (Wilde, 1999) Citrix's ICA protocol is packaged with its Metaframe application server products.

Windows	▪ 32-Bit: 95, 98, NT & 2000 ▪ 16-Bit: 3.1, 3.11 ▪ CE
DOS	▪ 32-Bit Real Mode Version
Macintosh	▪ MAC – 68K & PowerPC Versions
Unix	▪ HP-UX ▪ IBM-AIX ▪ Solaris SPARC ▪ Solaris x86
Linux	▪ Red Hat ▪ Caldera ▪ SuSE ▪ Slackware
Web Solutions	▪ Active X Control (Windows 32-Bit Version) ▪ Plug-in (Windows 32-Bit & 16-Bit Versions) ▪ Java (Applet & Application Development)

Table 4.3. ICA Client Coverage (From Citrix, 1999)

(2) Terminal Services Advanced Client. Microsoft's remote desktop protocol (RDP) renamed terminal services advanced client (TSAC) in 2000 was developed in response to Citrix's ICA software product. Similar to ICA, TSAC is considered a screen scrape technology in that it only transfers keystrokes, mouse movements and screen updates over the network. The TSAC is still based on the RDP feature set but comes in three different forms. First, as an ActiveX control, it can be executed within Microsoft's Internet Explorer or any application that makes use of ActiveX controls. Secondly, TSAC can come as part of the Windows installer package, which is the way the previous RDP client was deployed. Lastly, TSAC is also available as a Microsoft Management Console snap-in component for Internet Information Server (IIS) to be used by administrators for IIS administration. (Microsoft, 2000) TSAC is bundled with Microsoft 2000 Terminal Server Edition (TSE) operating systems and is now in its fifth release. Unlike ICA, which supports several client types, TSAC only supports Windows 32-bit applications and the networking protocol TCP/IP. Because of this, consensus among analysts and large-scale thin client users is that TSAC software will not achieve widespread adoption since it is perceived as not being an open standard. (Angel, 2000) ASPs and large-scale users of thin clients that operate in a diverse application environment will require support for multiple computing platforms and TSAC currently does not offer this.

d. Optical Technology

With the coming of age of fiber optics, new optical technology like the Dense Wave Division Multiplexing (DWDM) promises to boost the capacity of today's networks, drive down the cost of bandwidth and alleviate the bottlenecks that slows

communications. DWDM is a technology that uses lasers and transmits multiple light signals simultaneously over a single optical fiber. Each signal travels over its unique color band enabling existing fiber optic infrastructure's capacities to be increased exponentially depending on the DWDM configuration. This is a large-scale improvement from the time division multiplexing (TDM) technology used in most of today's networks. With DWDM, up to 80 and theoretically more separate wavelengths or channels of data can be multiplexed into a lightstream transmitted on a signal fiber. Another advantage of DWDM is that the data is de-multiplexed back to its original form at the end of the transmission and therefore, different data formats such as SONET, ATM, SDH and IP can all be transmitted together on the same optical fiber. (Lucent, 2000) While DWDM is not yet in the mainstream, some companies are taking the lead. One such company is ISP Cogent Communications, which implemented its first end-to-end optical network system, which it purchased from Cisco Systems. Cogent Communications indicates that DWDM technology allowed them to lower their monthly costs for T1 circuits from approximately $4000 to $1000. A spokesman from Cisco Systems also commented that an all optical network architecture will drive down the cost of delivering a megabyte by over 100 times. (McGarr, 2000)

e. Microprocessor Technology

Increased bandwidth will require faster microprocessors and companies like Intel, among others, have been working on these next generation of microprocessors. One such chip is Intel's IA-64 processor, which it has been working on since 1994. The IA-64 microprocessor is a 64-bit chip that uses what Intel calls "explicitly parallel instruction computing" or more commonly know as EPIC. EPIC is capable of processing

exponentially more work than 32-bit processors. For instance, a typical 32-bit processor can address four giga-bytes of virtual memory space while the IA-64 EPIC processor is capable of addressing 16 million terabytes of virtual memory space. (McGarr, 2000) Microprocessors such as these, coupled with increases in bandwidth as well as other complementary technologies, will inevitably assist the ASP industry in gaining a foot in changing the way organizations view and use software in the future.

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V. CUSTOMER CONSIDERATIONS

A. ASP PRICING MODELS

1. Subscription Model

One aspect where the ASP model is stabilizing the quickest is in the area of pricing. Not the prices they are charging for their services, which can vary, but instead a consensus on the pricing model they are using. Currently, the model of choice is the subscription model. A survey conducted by the Information Resources Group indicated that 65 percent of the ASPs they polled charge their customers a monthly subscription fee. (Mateyaschuk, 2000b) However, this model can take one of two forms, either a rental subscription or a lease subscription.

With the rental subscription, the customer never owns the software licenses. The ASP instead incorporates an initial fixed charge for setup and integration and then charges a monthly service fee on a per user basis, which can be increased as more users are added. This service fee covers everything needed for running the application, including support, maintenance, upgrades and bandwidth. The rental model normally appeals to customers that need one-time or occasional access to an application because it allows them to not buy the program at retail but instead it allows them to rent it for a fraction of the cost.

Comparatively, with the lease subscription, an ASP will sell the customer the software licenses up-front and then charge a monthly service fee on a per user basis which covers all other expenses. The lease model can become costly for the customer since software licenses can be expensive. For instance, customers wanting to implement an ERP application from either Oracle, PeopleSoft or SAP are having to pay anywhere

from $4000 to $30,000 in license fees for a single module. (Maselli, 2000) Harper, Vice President of USi, says the reason the subscription model has had so much success is because of is its stability and predictability of costs as compared with the unpredictability and fluctuating costs associated with other pricing models. (Myron, 2000) He goes on to say that ASP customers are able to maintain more value with the subscription model because as the level of usage or transactions goes up, costs do not. (Myron, 2000) This gives the customer definable costs that can be budgeted for on a monthly or annual basis. Hadaway, CFO of Premiere Technologies, indicated it was the fixed monthly fee that convinced his company to select ASP Transchannel for its applications needs. Hadaway believes it eliminated the guesswork when determining future expenses, and as a finance person, he appreciated knowing what the fixed monthly fees were going to be. (Myron, 2000)

a. Subscription Pricing Example

ASP Personable.com offers a variety of discrete software applications for both the individual user as well as the corporate user based on a rental subscription. Applications include personal and business productivity software as well as educational, entertainment and utilities software. To access the applications, customers need a browser-capable computer with an Internet connection of at least 56 Kbps. Once an account is established, Personable.com then creates a personalized virtual desktop for each user based on the applications they rented. Once operational, users can save their work locally on their own computer's hard disk or they can save it on Personable.com's servers. The benefit of saving on remote servers is that it allows customers to access their data from any computer with Internet access. With Personable.com's pricing plan,

customers only select and rent the software they need, when they need it and for however long they need it and pay no license fees. Currently, depending upon the applications selected, subscriptions can range from being free to as high as $19.95 per month. For instance, the cost for Microsoft Office 2000 standard is $19.95 per month for the individual and $14.95 for a corporate account. Other applications such as Microsoft's FrontPage, PhotoDraw and Publisher are less expensive. They range from $9.95 per month for the individual to $6.95 for a corporate account. Subscription prices also include 10 megabytes of storage space with additional storage costing $1.00 per 10 megabytes. (Personable.com, 2000) Finally, Personable.com provides its customers access to a variety of freeware with every opened account. The freeware includes products such as: Acrobat Reader, which reads PDF files; Cool Design, a web authoring tool; APR calculator, for calculating renting versus buying; and various personal productivity applications as well as games such as checkers and backgammon.

2. Usage Model

The usage-pricing model, also called a transaction model, is a true utility model in that a customer only pays for what they use unlike the subscription model. This is in the tradition of modern utility companies such as water, gas and electricity. This method of billing, although sought after as a choice by ASP customers and written about in the ASP literature, has not gained traction for at least three reasons. One is that very few ASPs have the ability to monitor and meter applications traffic that flows on the network, making it difficult to bill customers based on usage. This according to Briody (1999) is because ASPs have mostly focused on putting together their technology infrastructure and have neglected the business infrastructure. Secondly, Briody (1999) also contends

that the business tools currently available to monitor and meter applications traffic are not mature. Myron (2000) suggests this type of billing won't work for the same reason the ISP industry was forced to offer a flat monthly fee for unlimited Internet access when initially they charged by the minute or hour for access.

Although the usage-pricing model isn't widely used, advocates still contend it's the preferred choice of ASPs. (Mateyaschuk, 2000b) ASPs believe that if they bill for services in the same manner as phone companies they can better maximize profits and predict usage patterns so as to scale their services accordingly. (Torode, 1999) Therefore, ASPs that offer usage billing are either using new tools specifically developed to meet this niche market or they are contracting with NSPs that already have a customer billing system in place. The value-added benefit of contracting with NSPs such as AT&T, MCI WorldCom and Qwest Communications is that they are able to provide ASPs with the required network layer, as well as the business infrastructure, which is composed of the billing platform and customer management functions. (Burney, 2000) Alternatively, some ASPs are implementing their own usage billing systems. One such system is Narus's Internet Business Infrastructure (IBI), which helps ASPs capture detailed information about applications usage and allows for added benefits such as fraud detection, quality of service diagnostics, invoice and billing preparation and subscriber management. (Narus, 2000) With products like IBI or by contracting the capability to offer usage-based billing, ASPs believe they can differentiate themselves from their competitors in the type of services they deliver as well as the billing plans they can offer. As Kagan points out, ASPs will use their billing systems as the key differentiator in the future, much like cell phone or long-distance phone companies do today, tailoring their

offerings for different types of customers. (Briody, 1999) Additionally, ASPs contend that applications will become commodities and as a result, catered billing arrangements and value-added services will likely become the key selling points in the future. With usage-based billing, customers will have a variable direct expense rather than a fixed allocated expense. This, Torode (2000) claims, will allow costs to condense if the organization's business drops.

B. SERVICE LEVEL AGREEMENTS (SLA)

1. Introduction

Applications have evolved from a productivity enhancement tool to a core requirement for some organizations. Application availability is no longer a question of end-user satisfaction, but a matter of preserving the integrity of the business process. When application service is compromised, so is an organization's ability to conduct business. Consequently, business opportunities are missed, competitive edge is lost and productivity is diminished. (Amdahl, 1998) To remedy this, customers are using SLAs to protect themselves from poor service. Comparatively, ASPs are using SLAs as a means to differentiate themselves from the competition and gain market share in this nascent indusrty. (Caron, 2000) An example of this is SLA application uptime guarantees, offered by ASPs NavaSite and Center 7. NavaSite offers customers 99.99 percent guarantee while Center 7 offers its customers a 99.999 percent guarantee. (Maselli, 2000) Butt suggests that guarantees such as these are nearly impossible to achieve, unless the ASP has conveniently written itself an out in the SLA. (Maselli, 2000) Therefore, it's important for a customer to understand what elements compose a SLA. By definition, a SLA is a legal document that is signed by both the customer and the ASP and outlines the

types of services to be provided and the levels at which they will be provided. Services addressed can include network, server and application performance, availability, security and response times. It also outlines the penalties for shortfalls as well as incentives for service levels exceeded. (Caine, 1997) All too often, SLAs become a problem. Gartner Group indicates, that by 2002 more than 70 percent of ASP contracts will be renegotiated because of SLA failures. (Maselli, 2000) Therefore, with a properly negotiated SLA, the ASP takes on a level of responsibility that is both understood and agreed upon by the customer and the ASP.

So how does the ASP and customer arrive at such an agreement? According to Sopko (2000), if a customer wants an all-inclusive SLA that covers everything from end-to-end, they probably won't get one, that is, unless they are willing to pay for that comprehensive coverage, which will come at a high price. Therefore, to meet the needs of both the ASP and customer Sopko (2000) believes that a balanced SLA is the answer. A balanced SLA is defined as meeting the customer's need for protection while at the same time understanding the risk that an ASP takes by providing this protection. A balanced SLA serves a twofold process in that it: (Sopko, 2000)

- Assures customers of a basic set of service expectations that the ASP promises to meet
- Protects the ASP by limiting liability, identifying responsibilities and rationally managing expectations

2. SLA Components

Constructing good SLAs involves many factors. Below is a discussion of the key factors that customers should be aware of when negotiating SLAs:

a. Third Parties

Generally ASP arrangements involve more than just the ASP and the customer. They typically involve numerous other companies. As discussed in chapter three, an ASP is composed of many companies that bring together a variety of services which, ultimately forms the application service. These services can include WAN services, software, systems integration, consulting, infrastructure hosting and ongoing support. SLAs often refer to these companies as third parties because they don't sign the contract between the ASP and the customer. (Sopko, 2000) Because of this, it is necessary to understand who is responsible for what. Typically, SLAs incorporate third parties in one of two ways.

First, the ASP assumes all responsibility for the actions of its contracted partners. This comes at very high risk to the ASP. Customers that demand this complete end-to-end responsibility from their ASP should expect to pay for it. According to Sopko (2000), this is not revelation since every properly balanced business agreement seeks to reward risk with money. However, Sopko (2000) also urges that customers be cautious since ASPs often talk about taking risks, charge for it, then put into place SLAs that seek to eliminate the very risks they contractually accepted with that customer. Benefits of requesting that an ASP take full responsibility for end-to-end service include that it:

- Eliminates the need for a dedicated contract management staff that oversees the contractual obligations of third parties
- Establishes a clear line of demarcation between the customer and the ASP

Secondly, third parties can be incorporated in to an SLA by designating that the ASP is responsible for its own actions and not that of its subcontracted partners.

(Sopko, 2000) This method mitigates the risk and cost to the ASP, which in turn enables them to lower the prices they charge their customers. By taking this route, customers can reduce their costs, however, they also assume the additional contract management duties associated with managing these third parties. For example, if a WAN circuit fails, it is the responsibility of the customer to have contact management in place that knows to pursue the NSP and not the ASP. However, Sopko (2000) points out that what normally occurs is that the customers who demand rock-bottom pricing from their ASPs are also the same customers who refuse to spend money for contract management. Thus, for the SLA to work, both the ASP and customer must understand what end-to-end responsibility entails and agree where the customer responsibility stops and the ASP responsibility begins.

b. Measurement

IT managers want guarantees that an ASP's network and applications will perform well. To meet these expectations, ASPs are offering SLAs that offer guarantees for such items as WAN and application availability, performance, delay and recoverability. An example is MCI WorldCom's subsidiary UUNet Technologies (UT), which offers a 100 percent uptime guarantee for its WAN services provided to ASPs. (Maselli, 2000) How does an NSP like UT make such assertions and get away with it? The UT SLA fine print states that the 100 percent guarantee doesn't include outages during maintenance windows, outages caused by the customer or its equipment, natural disasters and others set forth in the full SLA. (UUNet, 2000)

Other factors to consider when evaluating SLAs include the timeframes for each performance metric. For instance, a 99.9 percent availability guarantee over a

year translates into one bad outage that lasts more than one working day. Whereas, the same 99.9 percent guarantee over a month means no more than 44 minutes per month. Therefore, negotiating SLAs is not as simple as playing one ASP off another because the real differences are not in the numbers but in the methodology for generating the numbers as well as the contractual fine print. However, these service guarantees are meaningless unless there is a way to measure it. The following are some typical measurements that are addressed in SLAs: (Bort, 1999)

- Outage – A change in performance that keeps the customer from being able to use the ASP's services. This can be applied to the customer as whole or individual customer sites
- Outage Duration – Time that the ASP's services are offline. This can be measured in minutes, days or months. Typical measurements are minutes
- Degraded Service – Not an outage, but service that is slower than contracted for. Usually measured in impacted user minutes
- Total Service Availability – Total time the ASP's service is available. This can be measured in minutes, days or months.
- Defects Per Million – Minutes of downtime per million minutes of service
- Mean Time Between Failures – Average amount of time between outages. Typically measured in minutes or days
- Mean Time To Restore – Average amount of time it takes an ASP to restore service. Typically measured in minutes
- Maximum Time Between Failures – Cap on the time it takes to reestablish service
- Trouble Rate – How often technical support is contacted
- Repeat Trouble Rate – How many times the same problem is reported
- Average Round Trip Latency – Time it takes a transmission (packet) to complete. Measured in milliseconds

- Average Round Trip Delay – The time it takes a routine transmission, after the first transmission establishes the connection

c. Customer Support

Application support and help desk issues are also critical to the construction of the SLA. They deal with measurable performance, such as help desk response time, time to answer, time to resolution, time to escalation and the management of that escalation. Wallace indicates that a good rule of thumb is to write in a provision that calls for a vendor meet if the ASP is called three times for the same problem. (Bort, 2000) A vendor meet simply forces the ASP to have all vendors convene to solve a particular service problem if the ASP can not do it unilaterally.

d. Force Majeure

In outsourcing contracts, force majeure clauses, typically addresses failure to perform resulting from an act of nature such as an earthquake, flood or other natural disaster beyond the control of the outsourcer. (Deckelman, 2000) ASPs are attempting to expand this definition to include such items as failures of third parties, failures of hardware and software, customer's non-performance, technology changes and even delays in supporting products. (Maselli, 2000) Sopko (2000) calls it ridiculous since ASP executives use force majeure as means to prevent ASPs from being blamed for anything. As ASPs seek to broaden this definition, customers should try to keep it narrow and tightly defined. Nonetheless, a force majeure event should not absolve the ASP from any responsibilities. Therefore, provisions should be included in the SLA addressing the ASP's responsibility to correct and mitigate the effects of an excused performance failure. (Deckelman, 2000)

e. Customer Network

Most ASP deals do not provide for service from the ASP's servers all the way to the customer's desktop device. Generally, ASPs have a series of hand-offs between itself and the customer. For example, there are hand-offs from the customer's desktop device to the customer's LAN to the ASP's WAN and finally to the ASP's servers. In a scenario such as this, ASP's generally do not assume responsibility for the customer's internal network or client devices. According to Sopko (2000), this is because customers have outdated networks, old desktops, poor support and minimal compliance with software licensing. As a result, ASPs normally include a clause that stipulates that any failure of service caused by the customer's infrastructure suspends the SLA. (Sopko, 2000) So it's vital that the customer realize that their internal infrastructure can be a point of failure and will most likely be addressed in the SLA. It's therefore incumbent upon the customer to understand this. Caron (2000) states that without clear lines of demarcation between customers, ASPs, subcontractors and in some cases the public Internet, blame is easily passed and credibility lost.

f. Customized Components

The ASP model emerged as a one-size-fits-all, however, it has evolved and now some ASPs offer customization as a way to distinguish themselves from competitors. Customization can range from simple changes, such as changes in screen colors, to full application coding efforts. However, not all ASPs embrace customization since it makes it difficult and costly for them to deliver applications using the one-to-many model. (Dering, 1999) Sopko (2000) agrees that customization may be a great idea to get a tailored product but most ASPs do not cover software customizations in their

SLAs. Lee states that customizations are challenging since they can be lost with software revision and must be re-implemented adding time and cost. (Maselli, 2000) Thus, when using an ASP, customers must understand that if they customize the application, they need to be prepared to absorb the cost of supporting that customization. (Sopko, 2000) Lee further points outs that if customers do customize applications, it should be for strategic reasons and not personal preference. (Maselli, 2000) Common SLA language used in these cases normally requires that customers prove that every fault encountered with the application is not related to the customization before the ASP will take any action.

g. Infringement

Software licenses generally include a provision that requires the publisher to defend, pay damages and replace infringing software if it occurs that the publisher used a third party's work for use in their software. (Sopko, 2000) This serves to protect the publisher and their customer. With ASPs however, no one is sure whether there is pass-through protection. That is, from the publisher, to the ASP and through to its customers. (Sopko, 2000) In order to offer a basic protection, since no precedent has been set, customers should ensure that: (Sopko, 2000)

- Contracts and SLAs take into account the unique relationship between software publisher, ASP and customer
- Software used through the ASP guarantees patent infringement protection for the ASPs customers
- Contracts contain a provision requiring the ASP to pay any royalty or licensing charges associated with existing or future patents
- That a qualified intellectual property lawyer review the contract and suggest language that addresses these issues

h. Transition and Change

A flexible change provision should be incorporated into every SLA. (Sopko, 2000) Because of the IT upgrade cycle it's important to allow change over the life of a SLA. It would not be uncommon for services such as network, server and application performance, availability, security and response times to improve with better technology. Thus, with these improvements, it could drive down an ASP's costs and without a SLA change provision, customers can be locked in to higher prices. Likewise, ASPs incurring higher customer volumes may need to adjust SLAs to address the their changing requirements. With regard to change provisions, Sopko (2000) says to beware of change provisions that give the ASP sole right to change the SLA with little or no notice to the customer and no recourse. Sopko (2000) also suggests not allowing changes in IT or processes to invalidate SLAs. As an example, ASPs may negotiate a balanced SLA during the sales cycle then use the unilateral change provision to alter the SLA some time later as way to benefit themselves. The SLA should be used as a way to compel an ASP's performance and therefore, any change provision should be flexible and require consent from both the ASP and customer.

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VI. SUMMARY AND RECOMMENDATIONS

A. SUMMARY

This thesis focused on the ASP model, which represents a paradigm shift in the way software applications are managed and delivered to users. The emerging ASP industry is an early-stage, high growth market. Estimates indicate that by 2004, spending on ASP services will approach $7.8 billion with a 92 percent annual growth rate. (Kauffman, 2000) ASPs typically provide services for packaged software applications from a centrally managed facility. Customers access the applications remotely, over the Internet or private WAN. Unlike traditional IT outsourcers or companies that do application maintenance, ASPs rarely deal with customized applications. Instead, they contract with ISVs to support standard applications with minimal or no customization. ASP services range from simple application hosting to actively managing the application environment, which may include consulting, customization and integration of the applications, as well as ongoing technical support. The types of applications an ASP supports range from stand alone discrete applications that address a tightly defined business function to environmental ones that address an entire business process or processes. ASPs offer pricing plans that can take the form of monthly subscriptions or payments based on application usage. The ASP landscape is diverse with many different companies jumping into the mix because they see it as a dramatic change that will end with software being delivered as a service. (Bianchi, 2000) These companies include computer hardware and software makers such as Dell, Intel, Microsoft and Oracle; network and Internet service providers such as Qwest Communications and UUNet Technologies; consulting and systems integrators such as Electronic Data Systems and

IBM Global Services; and new start ups such as Corio, USinternetworking and FutureLink.

A natural occurrence of the ASP model is its multi-tiered architecture, which is composed of a number of interlocking layers. These layers include the ongoing management and support layer, systems integration and implementation layer, application layer, infrastructure layer and network layer. Depending on the ASP, some favor vertically integrated architecture in which they own and control every layer from top to bottom, while others prefer subcontracting each layer to best-of-breed providers. Some of the primary factors driving the use of ASPs include financial cost savings, lower IT management efforts, scarcity of skilled IT professionals, reduced capital investments, improved purchasing power, ubiquity of the Internet and the resurgence of thin clients and server-based computing technologies.

Finally, the ASP environment, which is unfolding today, is similar to the mainframe era in which timesharing offered customers both applications usage and data in return for per minute charges. Thus, the current ASP trend could be viewed simply as a return to the past where it is less expensive to access applications online on a subscription basis rather than purchase and maintain complex software at each organization's physical site. However, to think that using an ASP is just a return to the mainframe timesharing era is to miss the point. It is much more than that. The ASP phenomenon is developing into a bandwidth and application rich environment where the location of the computing capability is but another choice that the organization has available to them. Applications can be located anywhere with availability to users

wherever, whenever and however they are needed and with the decision made on economic and financial grounds rather than on technology limitations.

B. MAJOR CONCLUSIONS

ASPs have the potential to provide significant benefits to both the military and the federal government as a whole. For an ASP implementation to be successful, a great deal of effort and understanding will be required by CIOs, IT managers and users alike. The focus of an ASP effort should not be limited to the technological aspects alone. It must also include efforts to foster change and acceptance of the ASP paradigm

In addition to using an ASP, the government could leverage TCSBC technology and act as its own ASP. The following describes some of the problems currently faced by the government and the solutions that could be derived by using TCSBC technology:

1. Branch-Office Computing Recommendation

Issue

With a widely dispersed government workforce in branch offices or field activities around the world, implementing and managing IT has become more difficult than ever before. These branch offices generally have LANs based on either the traditional desktop computing model or the client/server computing model. Both require significant configuration and administration that leads to a substantial IT staff requirement. Also, these branch offices are further connected by WANs to other organizations causing vital applications and data to travel across a network. Using these two models calls for regular investments in newer equipment, higher capacity networks and a growing IT staff.

Solution

Implementing a TCSBC solution solves the problems associated with branch offices because it minimizes network traffic, which in turn eliminates the need to constantly upgrade LANs, WANs and desktop devices. This server-based approach also allows applications to be deployed, supported and managed from a central location, thereby eliminating the need for individual branch offices to hire and maintain IT staffs.

2. Cross-Platform Computing Recommendation

Issue

The government owns millions of computing devices such as PCs, UNIX workstations, Java devices, legacy x86 PCs and Macintosh systems. Unfortunately, few are interoperable and each requires software that's specifically written for it. As a result, the government is often forced into finding a work around, such as using emulation software or buying separate versions of software that support each different client.

Solution

A TCSBC solution enables virtually any computing device to access any 16 and 32-bit application without special emulation software, changes in system configuration or application rewrites. This means that the government can maximize their investment in existing technology while allowing users to work in their preferred computing environments. See figure 6.1.

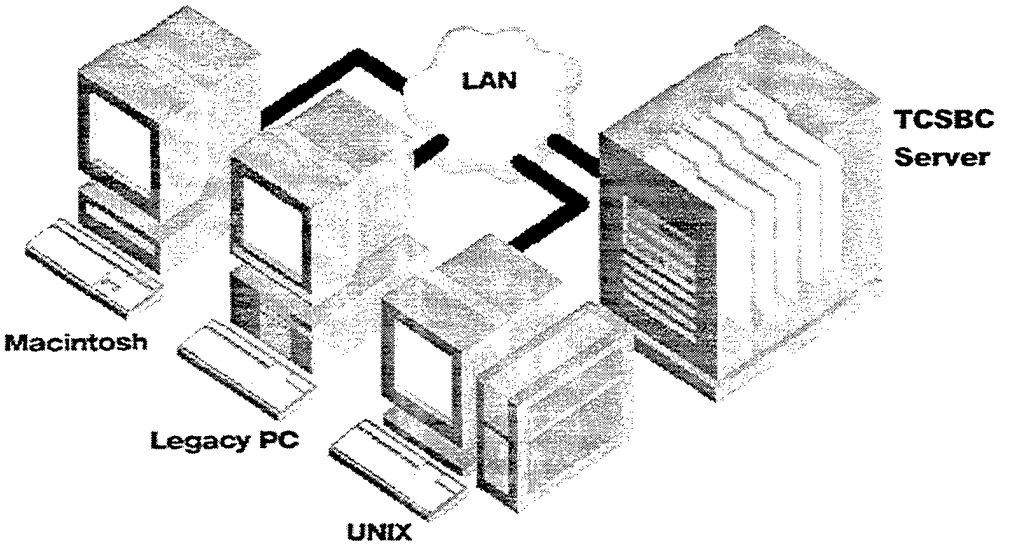

Figure 6.1. Cross-Platform Capability with TCSBC (From Citrix, 1998)

3. Tele-Computing Recommendation

Issue

As more government employees begin telecommuting from home, vendor offices and even hotel rooms, lower bandwidth connections can severely degrade application performance. This poor performance leads many users to abandon trying to access organization applications altogether and delay using them until they are back in the office.

Solution

A TCSBC implementation will increase the efficiency of remote users because it keeps all application processing on the server, which results in less traffic being sent across a WAN or the Internet. TCSBC is specifically designed and optimized for low-bandwidth connections so users can get LAN-like performance over analog or ISDN modems, WANs, wireless LANs and the Internet.

4. Thin Client Device Computing Recommendation

Issue

The government has purchased generation after generation of the latest hardware, software and networking technologies, which has led to stockpiles of diverse client devices and networks of varying capabilities. (Citrix, 1998) As a result, the government is now forced to employ a variety of operating systems, applications, processing power and connectivity options. Further, in attempting to deploy the latest applications to users, the existing technology investments can become a huge impediment requiring the government to increase investments in upgrades. Depending on the government's upgrade policy, which could be every 18-24 months for PCs, it can become very costly.

Solution

By implementing thin client devices, such as WBTs or NCs, in conjunction with a TCSBC approach, the latest application, including legacy applications, can be extended to the user without any concern as to the type of device being used. The benefits being that with thin clients there is a reduction in the amount of end-user support needed as well as a reduction in the TCA for applications that are server-based. Additionally, thin clients lengthen desktop longevity by protecting from technical obsolescence and breakdowns.

5. IT Staffing Shortage Recommendation

Issue

Organizations of all sizes are experiencing shortages in skilled IT labor. This shortage has grown over the past five years and the Information Technology Association of America indicates that approximately 850,000 IT jobs will go unfilled in 2000 and

grow to over one million by 2005. (ITAA, 2000) The Navy and the federal government are not immune to this shortage and in fact are experiencing it to a larger degree since they are unable to compete with the private sector in regard to salaries and benefits. (GAO, 1997) As an example, the U.S. National Security Agency recently acknowledged that it has struggled to hire and retain qualified IT personnel and therefore plans to outsource all of its computer and network operations in a contract estimated to be worth over 5 billion over the next ten years. (Messmer, 2000) Similarly, Soloway, DoD Deputy Undersecretary for Acquisition Reform, in a DoD Electronic Commerce Day speech told of Navy Captains that don't like to bring their ships into port because headhunters are lined up on the docks attempting to lure away IT staff. (Messmer, 2000) He also told of an Army Colonel who saw one of his top IT people offered a $30,000 raise by three companies. When the Army tried to keep IT worker with a one-time $30,000 bonus, the companies all came back with higher offers. The bottom line is that the government is losing the battle to retain IT personnel and without wholesale changes in the salaries and benefits being offered to government IT workers, the shortage will worsen.

Solution

By using an ASP's services or implementing TCSBC technology the government would need fewer IT workers. With an ASP the government shifts all accountability and support for applications and their associated hardware infrastructure to a third party but still retains the benefits in the form of a service. Similarly, by implementing applications in-house based on the TCSBC model the government benefits from centralized management, which allows applications to be deployed, supported and managed from a central location, thereby reducing the amount of IT workers required.

6. ASP Recommendation

For those organizations wanting to contract with an ASP, they should first determine whether they are a candidate for ASP services. Amore (2000) defines the following scenarios that lend themselves particularly well to an ASP-based solution, no matter what industry it is:

- An organization is facing a large re-engineering project or an IT installation in a new facility.
- An organization needs a new software application that the existing infrastructure won't support, or that would require increased staffing and retraining.
- An organization is growing so rapidly that scalability of software applications is a critical IT issue.
- An organization or units within an organization are in a region with a tight labor market, with high IT staff turnover and replacement costs.

Once an organization has determined it is candidate for an ASP's services, Amore (2000) offers some practical guidelines for the selection of an ASP:

- Verify an ASPs software application experience. Use only ASPs that have expertise in the application the organization requires. Don't accept an ASP's word for it. Check out their references.
- One solution does not fit all, so beware of ASPs that don't offer a range of prices and service levels. A large percentage of the value an organization gets is consumed by a small percentage of its users. Thus, it may be that an organization gets the same value by contracting 12 hour access for 50 key personnel as it would if it contracted for 7/24 support for 5000 personnel.
- There is safety in size, however it may come at the expense of personalized services. Large ASPs can achieve better economies of scale, which means the ASP is likely to be more stable and apt to stay in business.
- Keeping in mind that there is not a lot of history with ASPs, always have a contingency plan before a contract is signed. An exit strategy is essential if an ASP has performance problems, changes its business model or goes out of

business. Incorporating provisions in the contract that detail how applications and data will be handled helps to protect an organization.

- Savings from contracting with an ASP may not always materialize in hard dollars. Especially if an organization is replacing a fully depreciated system and refocusing IT staff on new tasks rather than downsizing. The payoff may be longer term, derived in part from reassigning IT staff to more strategic activities that build value in core business processes.

- Verify how the ASP protects sensitive data. Questions to ask are: Do they support encryption? How do the data center manage, backup and restore catastrophic failures? Does it provide replication, redundancy and RAID striping across all locations? Best rule of thumb is to find an ASP that provides at least the same security and precautions that a customer would implement at its own site.

- Don't lose control. An organization should designate a representative or contract team that holds regular meetings with an ASP's representatives. The customer determines the level of involvement. An ASP should be considered an extension of an organization's staff.

C. RECOMMENDATIONS FOR FURTHER STUDY

1. Cost/Benefit Analysis of an ASP Implementation

Conduct a cost/benefit analysis of an organization that has implemented an ASP contract. A student must have access to past and present data to determine whether cost savings were realized. A question to be answered is whether the implementation of the ASP service helped an organization focus on its core mission.

2. Assessment of an ASP's SLA Metrics

Research the use of the SLA metrics used to measure an ASP's performance. Determine if the metrics used for such items as WAN and application availability, performance, delay and recoverability are useful and to what extent they are effective. Develop a set of lessons learned based on an analysis of a specific case.

3. Assessing the CIO's Responsibilities

Research the role of the CIO while implementing an ASP's services. Determine what a CIO's role should be during and after implementation. Identify the key challenges a CIO faces and develop recommendations for improving them.

APPENDIX A. ASPIC EXECUTIVE MEMBERS

AristaSoft Corporation

AT&T

Boundless Technologies

Cisco Systems

Citrix Systems

Compaq Computer Corporation

CyLex Systems

Ernst & Young

Exodus Communications

FutureLink Corporation

Great Plains Software

GTE

IBM

Interpath Communications

JAWS Technologies

ManagedOps.com

Marimba

Onyx Software

QuantumLinks.com

Sharp Electronics

Sun Microsystems

TeleComputing

UUNet Technologies

Verio

Wyse Technology

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